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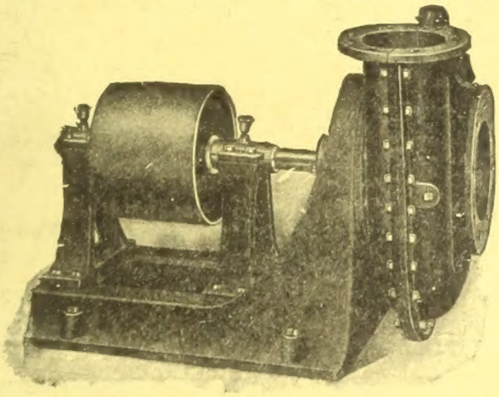
Vol. 27 Toronto, April 2, 1913 No. 14

Contract Record and Engineering Review

ESTABLISHED 1886

Steam and Power Pumps,
Condensers, Travelling Cranes



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"MADE IN CANADA"

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Made in all
Kinds of
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on Short
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Large Bent Plate Glass for Shop
Fronts a Specialty

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STEAM AND ELECTRIC
HOISTING ENGINES
LEYNER DRILL
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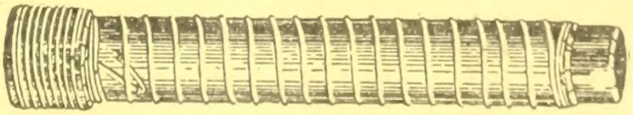

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WATER PIPE
RESERVOIR TANKS
for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

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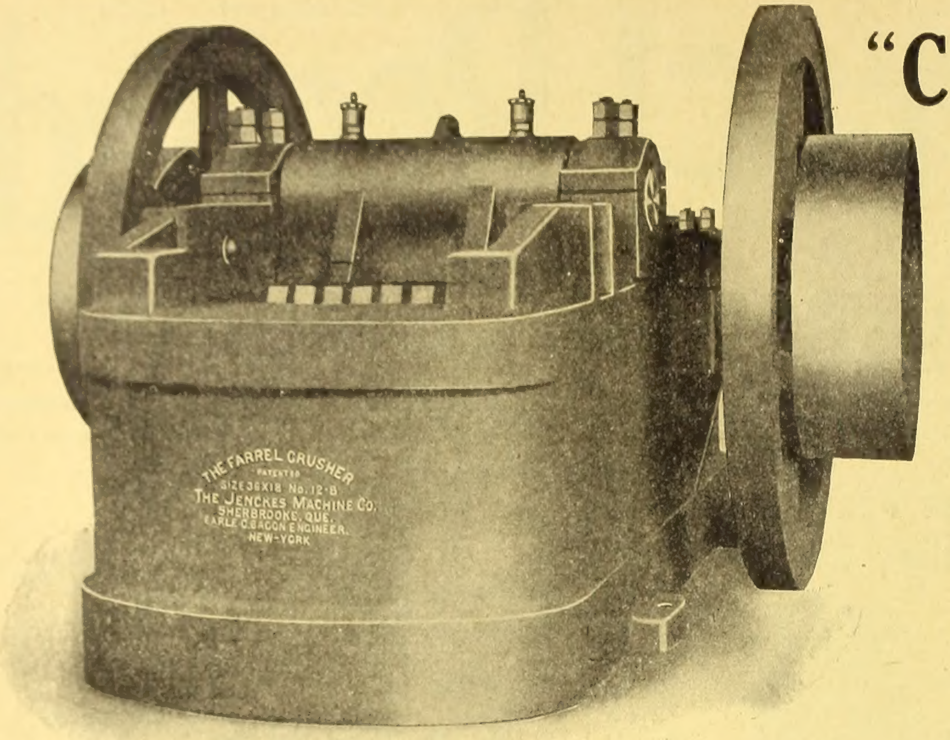
Classified Directory to Advertisements, Page 6



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Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

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General Offices: Sherbrooke, Que. **Works: Sherbrooke, Que. - St. Catharines, Ont.**

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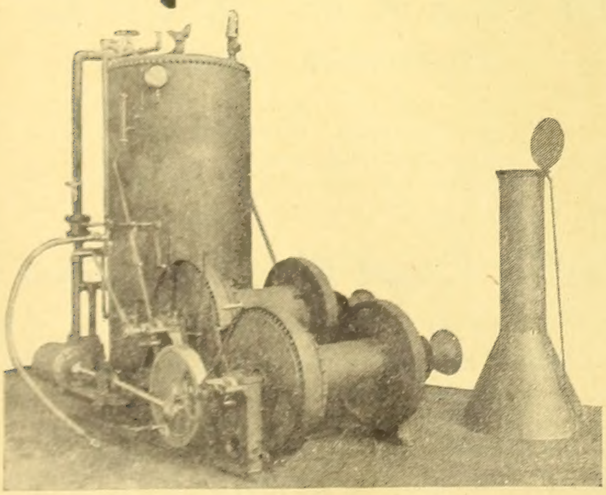
No Other Hoisting Engine Built

can do as much severe work as the

"AMERICAN"



It does its work with less human power, fuel, wear and expense, and with greater speed and accuracy than any other similar engine on top of earth.

When you need a Hoisting-Engine, let us prove these claims to you.

American Hoist & Derrick Co.

ST. PAUL, MINN.

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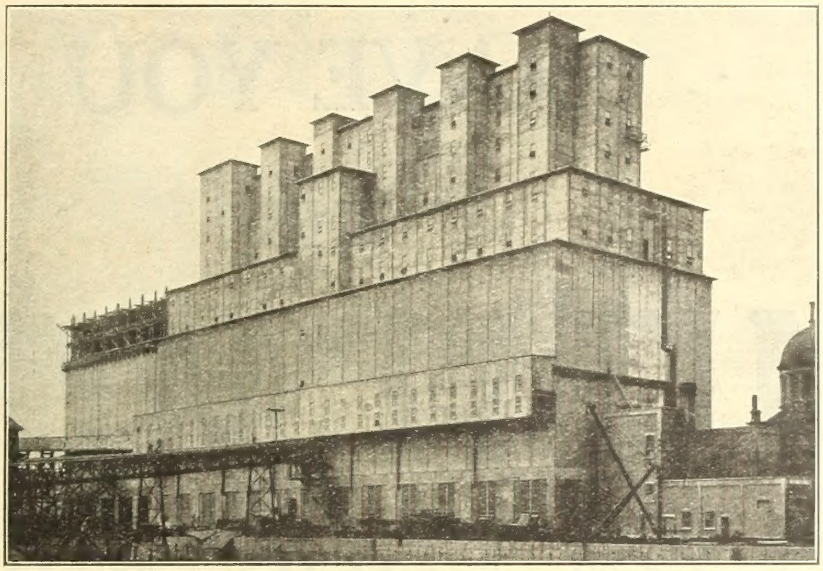

Built of Canada Cement

The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

Canada Cement Company
Limited
Montreal

SALES OFFICES:
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HAVE YOU

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SMITH MIXER

ON YOUR JOB?

Smith Mixers are Money Makers Because We Know:

They are Built of the Right Material.

They will Outlast any Other Mixer on the Market.

They will Mix Better Concrete and a Larger Quantity than any Other Machine and they Require the Fewest Repair Parts.

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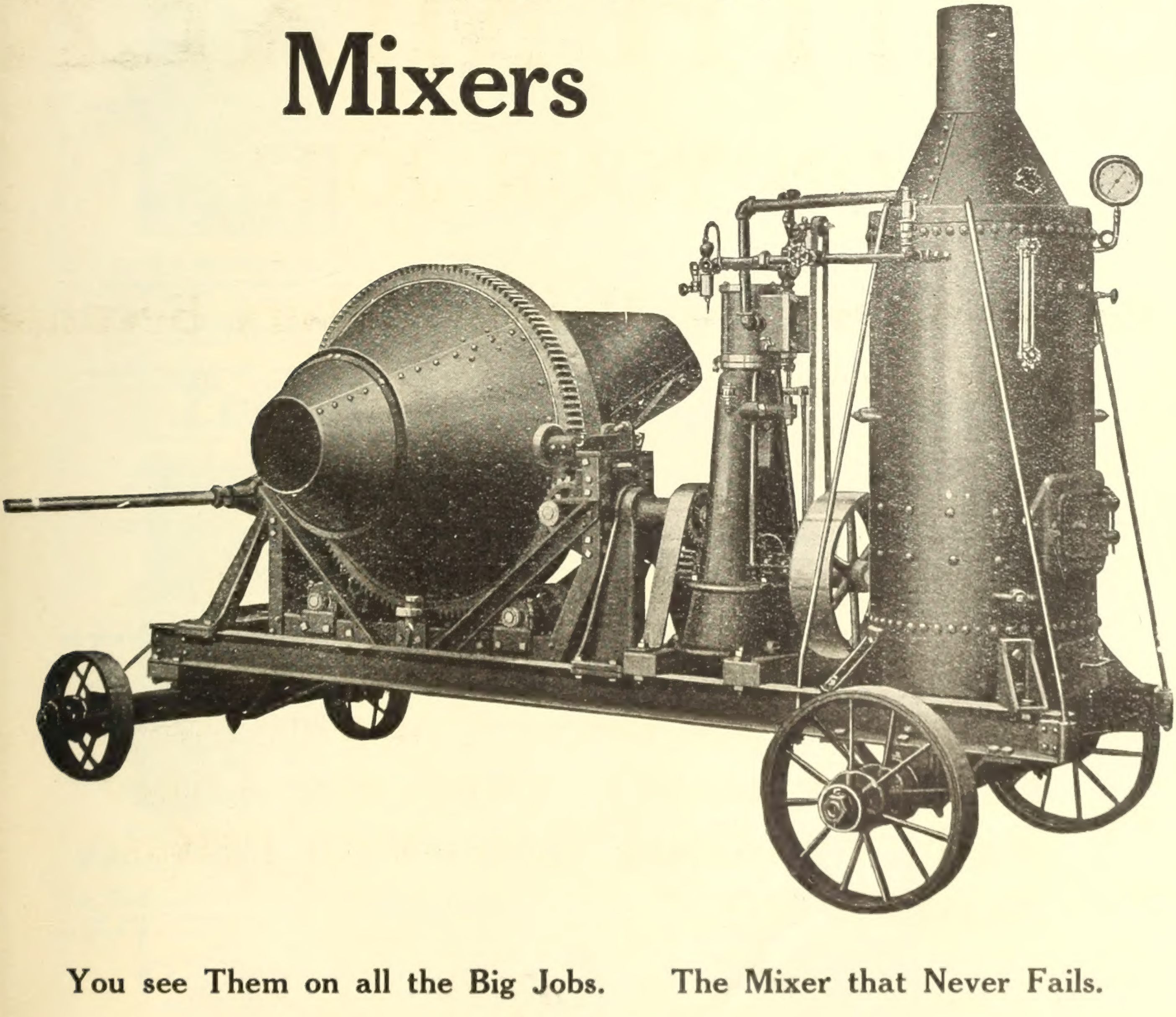
BUY THE BEST

That Will Be

Smith Concrete Mixers



You see Them on all the Big Jobs. The Mixer that Never Fails.

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Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

Don Valley Clay Products

For over twelve years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Lumsden Building, Toronto
J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.
Don Valley Fireproofing, Bricks and Tile used throughout.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Traders Bank, Toronto
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Don Valley Porous Terra Cotta Fireproofing and 2,0000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Royal Bank, Toronto
Eustace G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.
Don Valley Porous Terra Cotta Fireproofing and Bricks used

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

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Adelaide Street, Toronto
W. J. Carmichael, Architect. [illegible] Contractors.
Don Valley Porous Terra Cotta Fireproofing and Bricks used

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

A "Steelcrete" Bridge

The illustration shows one of the first reinforced concrete bridges in America and the first in Canada.

Completed less than three years ago it has proved such a success that over two hundred highway bridges throughout Canada have been erected along similar lines.

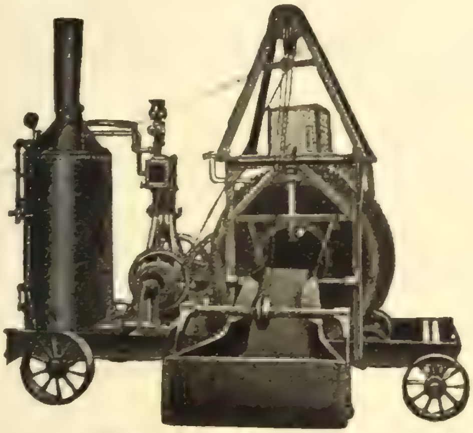
Rod reinforcement was used for all portions except the floor slabs which were reinforced with

"Steelcrete" Expanded Metal

If you have a stream to cross, erect a permanent crossing—a **"Steelcrete"** reinforced bridge. Are you in touch with our designing department?

Steel and Radiation, Limited
Toronto, Canada

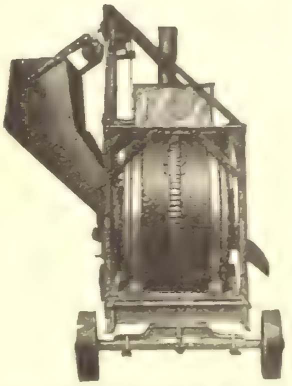
Concrete Mixers



Standard Drum Batch Mixer

SEVERAL KINDS and built in sizes to suit all classes of work.

The Many Improved features of the London Mixers have placed them in a CLASS BY THEMSELVES.



Standard Drum Batch Mixer

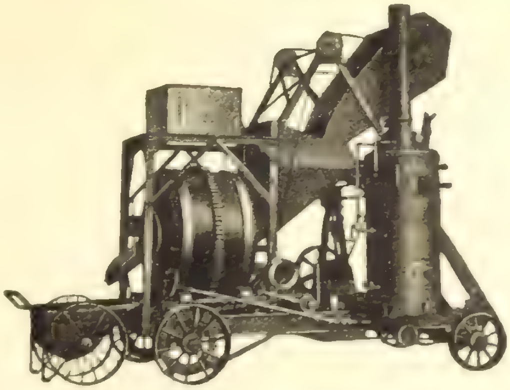
WE CAN SAVE THE CONTRACTORS MONEY. EVERY MACHINE MADE IN OUR OWN FACTORY.

On FIRST COST.

On COST OF MAINTENANCE.

On COST OF OPERATION.

SEND FOR OUR CATALOGUE



Rear Discharge Paving Machine with Forward Loader

Our Machines are not made down to a price, but MADE UP TO A STANDARD.

By Manufacturing IN A LARGE SCALE we have been able to offer High Grade Machines AT REMARKABLY LOW PRICES.

Paving Machine with Side Loader

We manufacture a full line of Concrete Machinery and Cement Working Tools. Also a full line of Hoisting Engines and Contractors Equipment.

We are the Largest Manufacturers of Concrete Machinery in Canada.

No. 2 Automatic Batch Mixer

London Concrete Machinery Co. Limited

Cabell St. and Kitchener Ave., LONDON, ONT.

BRANCHES:

WINNIPEG, (445 Main St.) W. H. Rosevear, Mgr.
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TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
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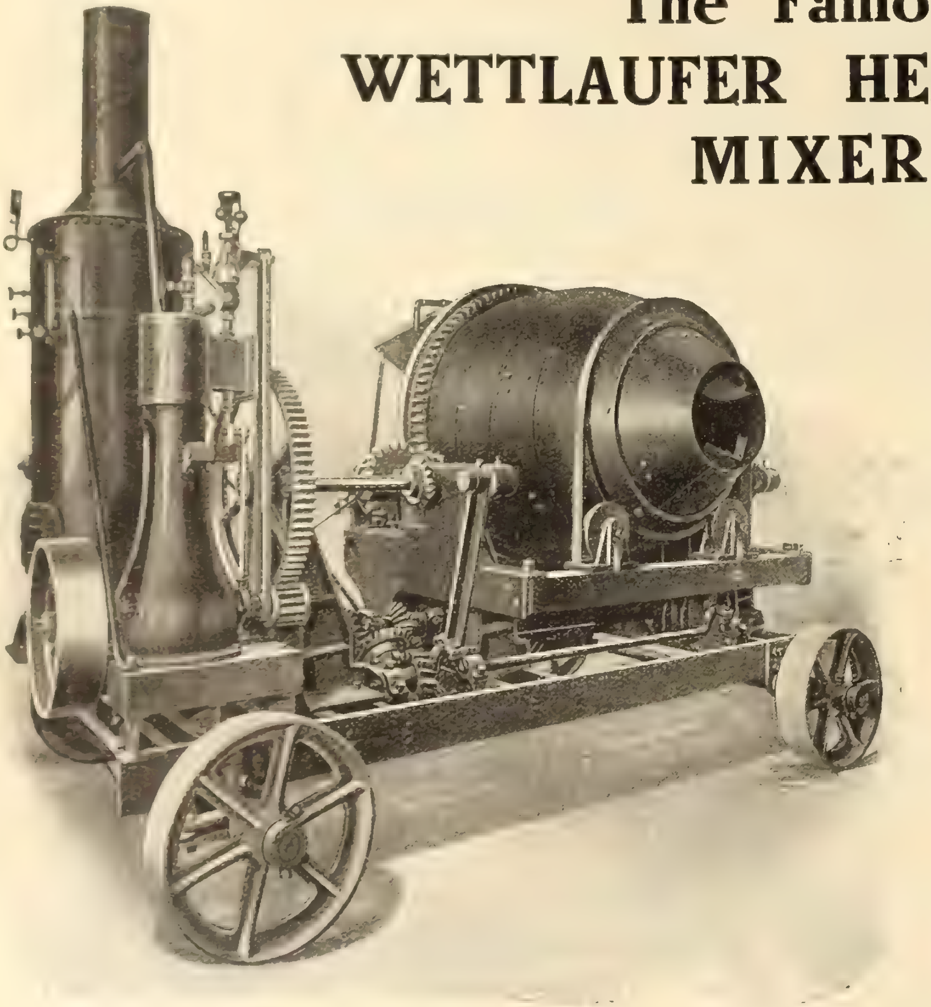
FORT WILLIAM, Northern Eng. & Supply Co
MONTREAL, Foss & Hill Mach. Co.,
QUEBEC, Rene Talbot

EVENTUALLY

—WHY NOT NOW?

You **must** have a **Good Mixer** some time—You can't go on putting up with a poor makeshift—You will realize some time that you **must** have a mixer that will do the best work, and when you realize that you will naturally turn to

The Famous WETTLAUFER HEARTSHAPE MIXER



This is the mixer that will do **good work** for you **all the time** — the mixer that saves you time and money and increases the efficiency of your equipment.

Strong Construction

Automatic Operation

Low Working Cost

Rapid and Perfect Mixing

Increased Capacity

Minimum Repairs

Full particulars and catalogue on request.

Come and see this mixer working—Continuous demonstrations at

WETTLAUFER BROTHERS

TORONTO, ONTARIO

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For Your Next Shipment of Cement, Order

Throughout the entire manufacture of Rogers Portland Cement every precaution is taken to keep the product at its high standard.

The care exercised in this regard has produced a high grade that is dependably uniform. This dependability is invaluable to many users of cement who do not have the time or opportunity to test each shipment, and who consequently rely largely upon the integrity of the manufacturer.

ROGERS
Portland Cement

We can supply you with the highest grade cement on the market—our

Well Equipped Mills

are a guarantee of uniform good quality and our

Ample Capacity and Good Storage

enables us when handling orders to take every advantage of railway and water connections—We are

Always Ready to Ship

at the most advantageous time as soon as we receive your order.

Mills at

Kirkfield - Owen Sound - Hanover - Orangeville - St. Mary's

Rogers Crushed Stone

For Sidewalk, Concrete Road and other contracts.

We can furnish crushed stone in all sizes, clean and free from dust, dirt and mould, and evenly graded. We have recently increased our plant to a capacity of 4,000 tons per day, and we can guarantee delivery of any amount up to 4,000 tons per day. This is the best line for road and concrete work—Thousands of tons used locally.

Plants at Dundas and Vinemouth

French Caen Stone Cement

As good as natural stone—but cheaper.—A perfect imitation—Adaptable to all ornamentation or architectural decoration, both interior and exterior.

Quotations made for all Work—Prompt Deliveries and Complete Shipments given from Stock

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(Continued on page 14)

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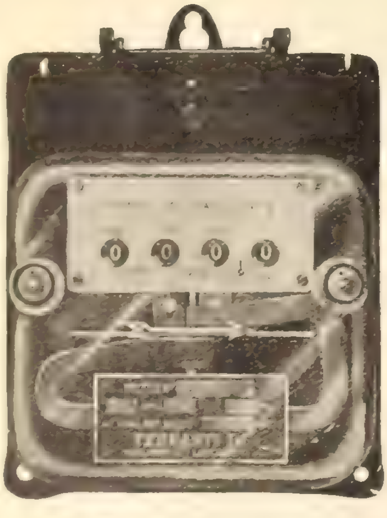
Ferranti

In Ferranti meters you have all the good qualities of a perfect meter; absolute accuracy, simple construction, top or bottom connections and perfect workmanship.

We would like to quote you on your meter requirements. Large stocks carried in Toronto and Winnipeg.



The Ferranti Electrical Co. of Canada, Limited
TORONTO, 90 Sherbourne St. WINNIPEG, 56 Albert St.

Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

Busy Contractors Use New Model Aurora Dump Wagons

because they want wagons that will haul the most material in the least time and that are on the job every working hour.

A novel feature has been added to this wagon which places it beyond comparison with any other on the market, namely, **a steel channel filled with wood for the main side board,** giving unusual strength. This is the portion of the wagon that stands the heaviest strain, With this reinforced side board, breakage is practically impossible. It is short coupled and built low. Light in weight. **Write today.**

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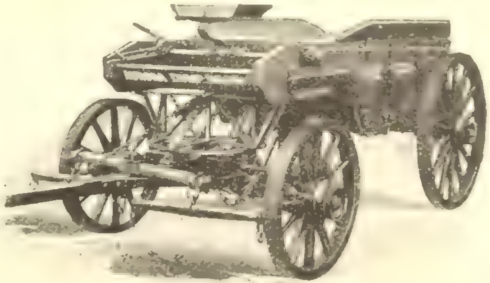

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or $5\frac{2}{3}$c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. **Limited**

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For these reasons they are more popular than any other kind.

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Special Note

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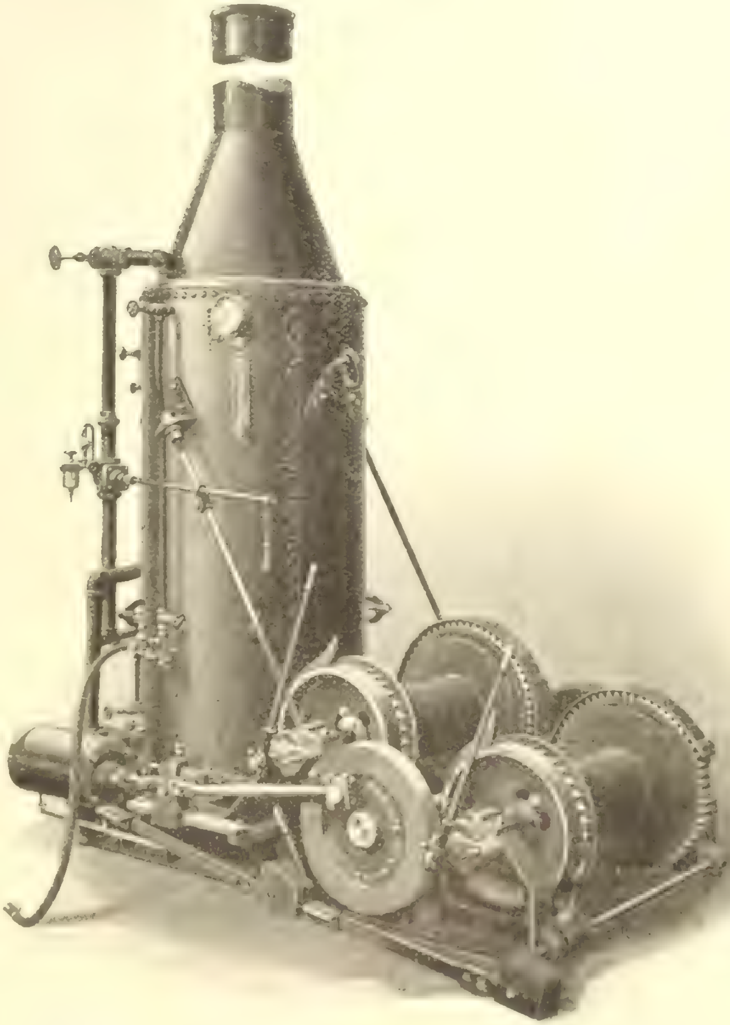

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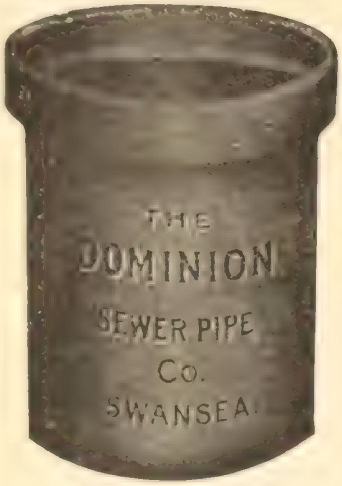

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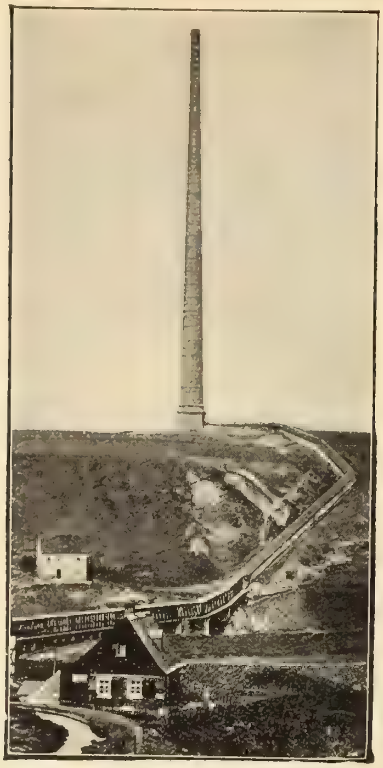

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Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

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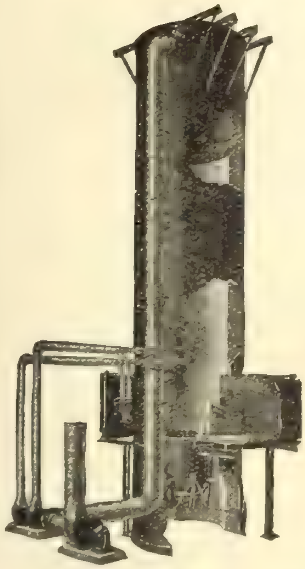

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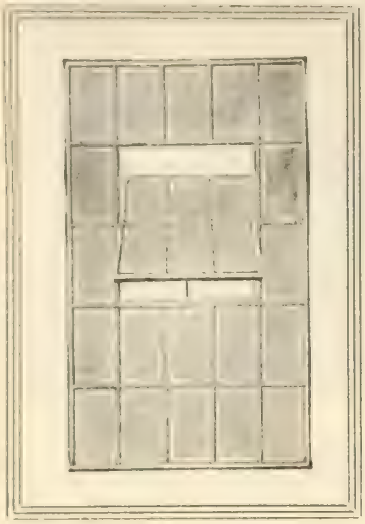

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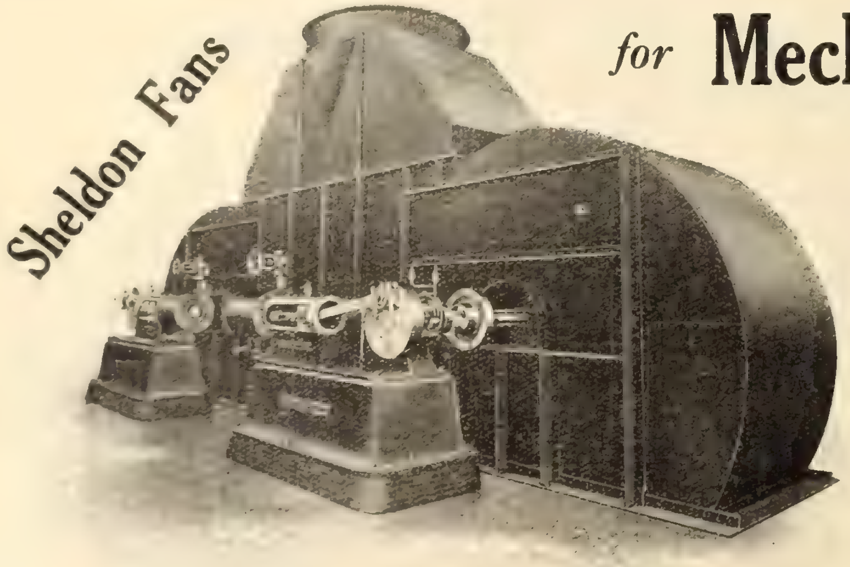

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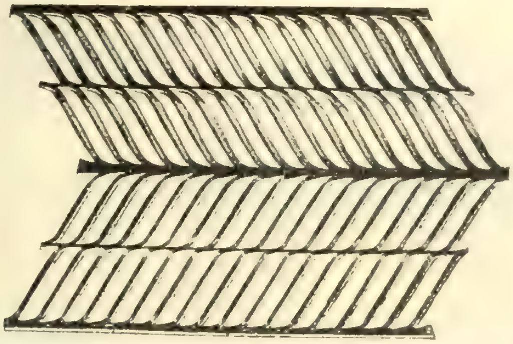

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Because you can then space your studding sixteen inches apart.

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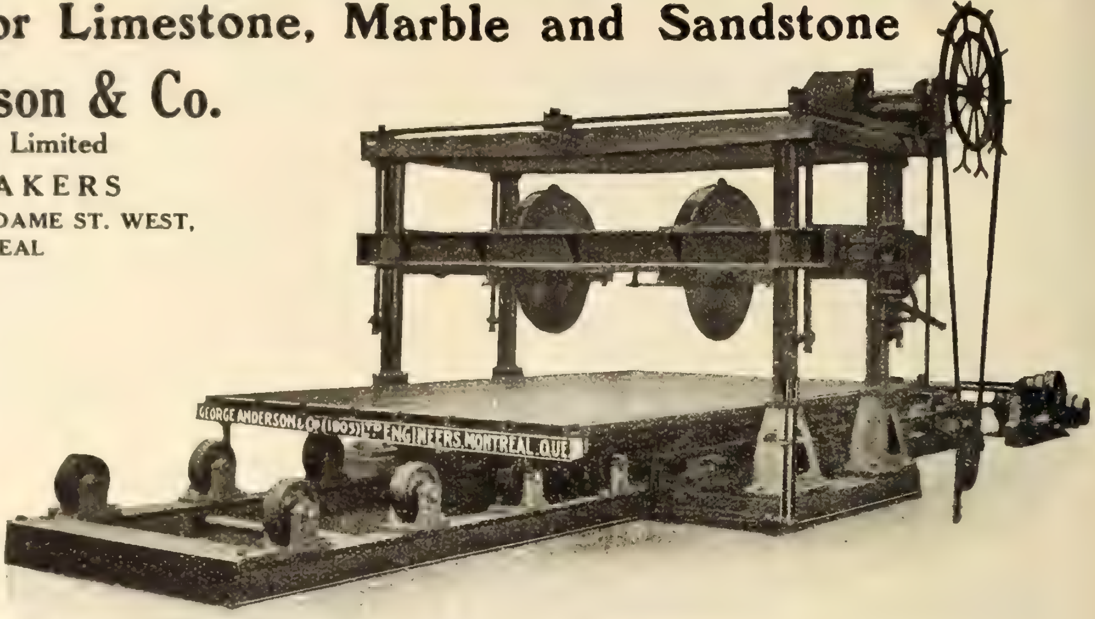

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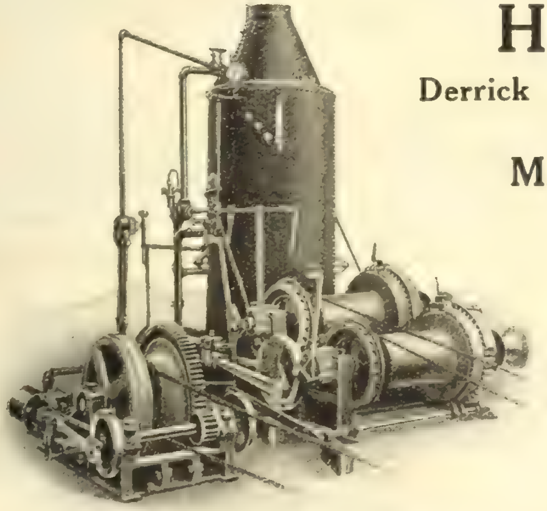

This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

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Works: GODERICH, Ont.
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Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT

The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

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The Thew Automatic Shovel Company, Lorain, Ohio

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20 lb. Section Rails
25 " " "
30 " " "
40 " " "
50 " " "

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60 Tons 25 lb. Rails, Ready for Shipment
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We hold stocks of
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30 " "
40 " "
60 " Angle Bars
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MERCHANT BARS ROUNDS and SQUARES 3/8 to 2-in. FLATS 3/4 x 1/8 to 4 x 1 ANGLES 3/4 x 1/8 to 2 1/2 x 1/2

Cold Twisted Squares for Concrete Re-inforcing made from New Steel Billets only.

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LIMITED

Plain
Rounds
and
Squares

Twisted Steel Bars
FOR REINFORCING CONCRETE

Bands
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all Sizes

Railroad Track Equipment, Invincible Fencing, Arm Braces, Trolley Wire, Telephone and Galvanized Wire, Nails, Screws, Tacks, Wrought Pipe.

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Annual Capacity 12,000 Tons

Stock Process for Small Work
Acid Open Hearth for Heavy
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Sturtevant Propeller Fans
REG. U. S. PAT. OFF.

For VENTILATING and COOLING

The design of our Propeller Fans is along the same scientific lines as all our fan product, and that is why Sturtevant Propeller Fans deliver more air for the same size fan and with less power expenditure than any other propeller type made. The construction is particularly strong and durable.

They will quickly change the air in factories, workrooms, kitchens, billiard halls, etc., carrying away the smoke, fumes, hot air, keeping the atmosphere sweet and cool.

The electric fans are equipped with motors wound for either alternating or direct current. *Ask for Bulletin No. 146 Z.*

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Canada Steel Co., Limited
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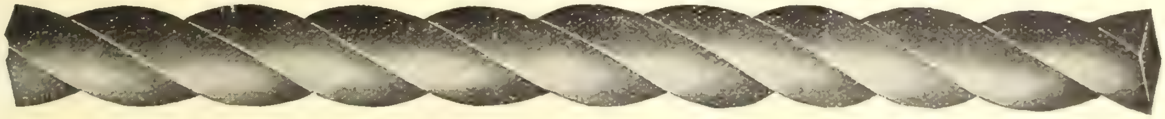

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For Reinforcing Concrete
Plain Rounds Squares
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Cross Arm Braces, Plain and Galvanized.

We can ship from stock
Ask for prices—they will interest you.

STEEL

Angles from ¾ x ¾ in. up to 2 x 2 ins.
Round and square from ⅜ in. up to 1¼ ins.
Flats from ¾ in. up to 4 ins. in width, and other special sections.

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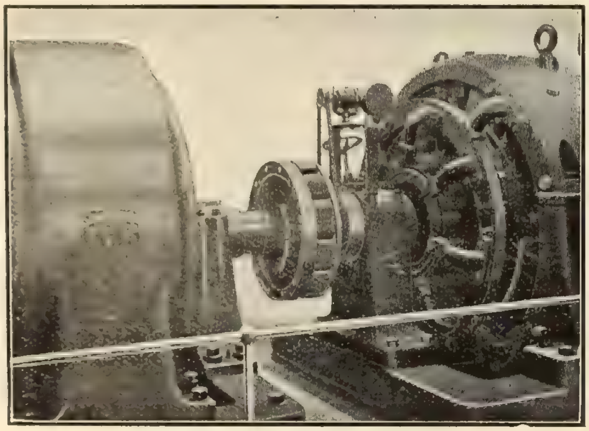

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5,000 TONS OF STEEL IN STOCK

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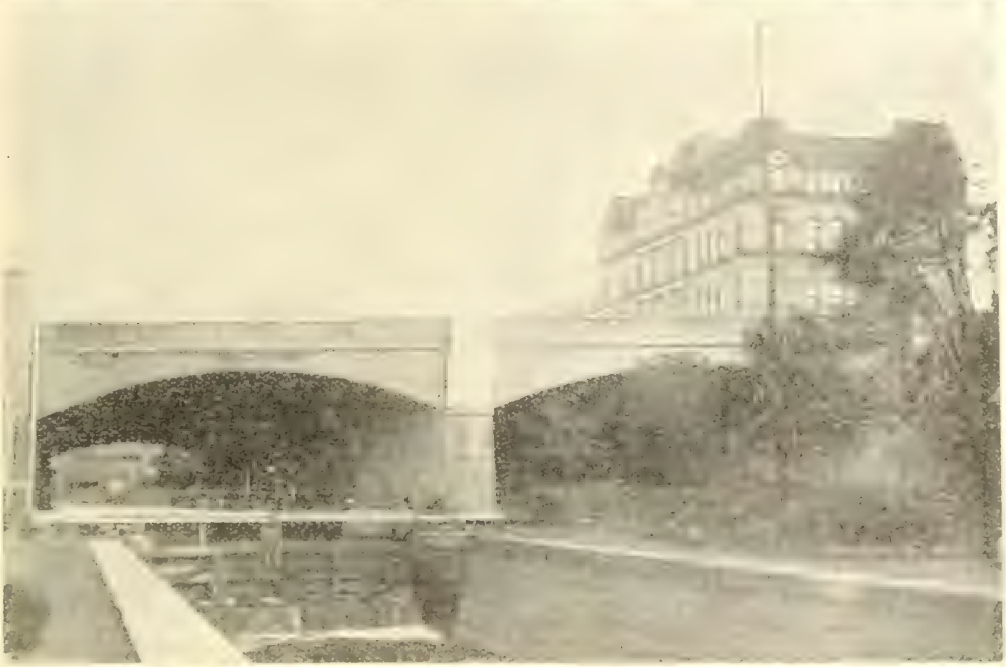
CONCRETE REINFORCEMENT

Due to our increased capacity we can ship carload quantities in ten days to two weeks from receipt order and full details at mill.



New Plaza Bridge, Ottawa, Reinforced with Triangle Mesh

Three spans, 53, 60 and 60 ft. long respectively. Widths at ends 28½ ft. and 18½ ft. Entire length of Concrete structure 265 ft. Roadway 35 ft. above water level. Solid Rock Foundation. Thickness of bridge at crown 22 inches. Tested to carry 20 ton steam roller

Reinforcement originally designed for bars. TRIANGLE MESH SUBSTITUTED BECAUSE OF ECONOMY IN COST, WEIGHT OF MATERIAL AND APPLICATION.

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Speed **Quality**
Durability **Economy**

are **all** combined, because it was designed and built by experts trained in engineering and also machinery building. Its Quadruple or Four Way Mix is guaranteed to stand any test. It has fewer parts than any other mixer; consequently no excessive repair bills. In any size demanded; standard or batch hopper or power charger; steam, gasoline or electric power.

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"Eveready" Saw Rig—Another Oshkosh feature—saws mitres, bores, sands, dados, jig-saws and grinds tools, on the job. Attachments for all this furnished free. Pays for itself in a season. Sold on **six-day free trial.**

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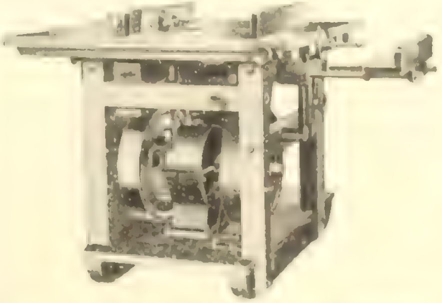

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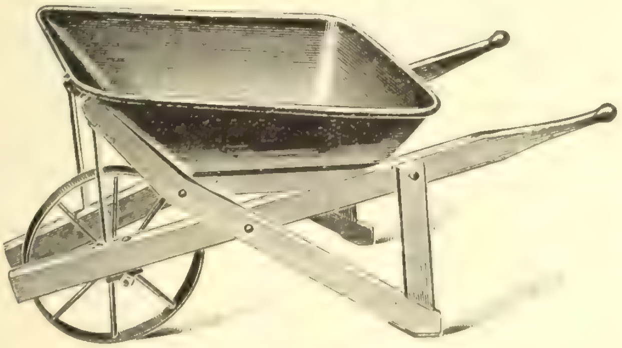
IRON AGE



CONTRACTORS' SUPPLIES

As makers of the high grade "Iron Age" products we solicit your trade in the following lines:

DRAG AND WHEEL SCRAPERS—
Each Drag Scraper is pressed from a solid sheet of high-carbon steel—no joints or seams. Our Wheel Scrapers have all the latest dumping attachments and are supplied with either pressed or square bowl. All "Iron Age" Scrapers are of standard capacity.

STEEL TRAY BARROWS—
The trays are pressed from a solid sheet of high-carbon steel and the edges are turned over. Fitted with heavy steel wheels, hardwood frames, long handles, in fact the whole construction is thoroughly substantial.

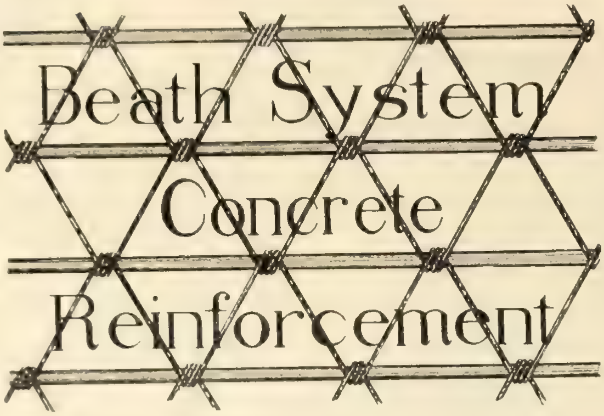
PICK AND ROOTER PLOUGHS—
Nothing to break, bend, or get out of repair. [illegible] can be used without straining the parts.

Write us for catalogues.

THE BATEMAN-WILKINSON CO., LIMITED
340 CAMPBELL AVE., TORONTO

Triangle Mesh

in the



Made of cold drawn mild steel wire, guaranteed tensile strength 90,000 lbs., elastic limit 50,000 lbs. per square inch.

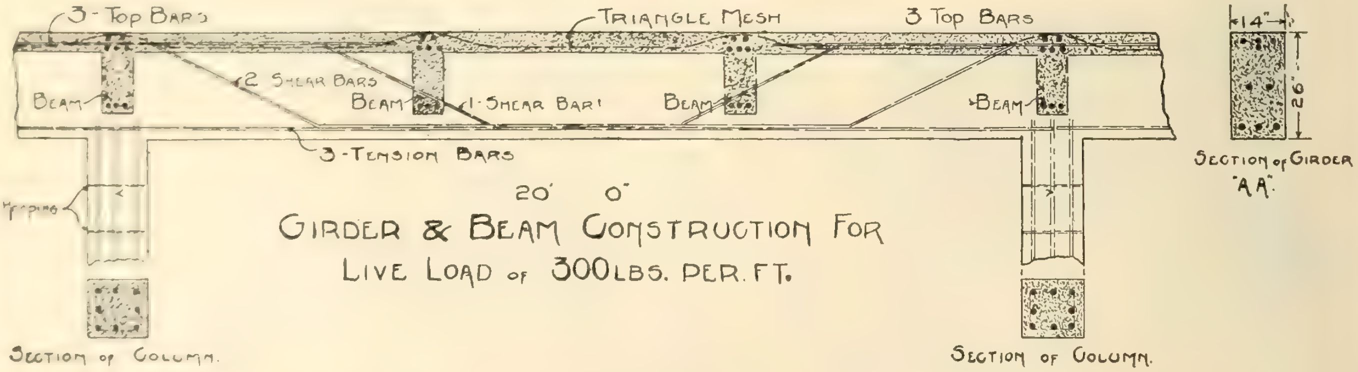
Supplied regularly in rolls 150 ft., 500 ft. and 600 ft. in length, allowing continuous reinforcement over supports. Cut to general length if required.

Main stresses carried on heavy longitudinal or tension members. Diagonal cross wires provided to assist in longitudinal reinforcing and at the same time distribute stresses to main tension members and take care of temperature stresses and strains.

Detail of Reinforcement. Style No. 23

- Provides more even distribution of steel reinforcing in every direction.
- Tension or carrying members accurately spaced.
- Most perfect mechanical bond.
- No tying or lapping necessary.
- Minimum cost of laying.
- Easily handled and stored on the work.
- Low cost of inspection.
- Absolutely continuous action from end to end in structure.
- Higher elastic limits with the same quality of steel due to cold drawing.
- Every ounce of steel tested, as it cannot be cold drawn without showing defects, if any.
- Diagonal cross wires distribute stresses due to concentrated load over a greater area.
- The only design of fabric reinforcement where cross of diagonal wires assists longitudinal or tension members in carrying the load.
- Supplied black or galvanized, but black is recommended owing to its better bond in concrete.

BEAM AND GIRDER BARS



GIRDER & BEAM CONSTRUCTION FOR LIVE LOAD OF 300 LBS. PER FT.

BEATH SYSTEM.

The Beath System Concrete Reinforcement is applicable to any form of concrete construction and offers advantages that cannot be obtained elsewhere. We can show you how to build a fireproof building at the lowest cost possible.

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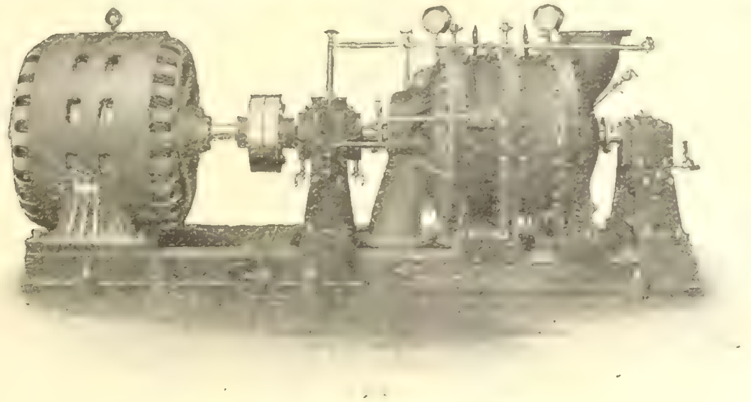

"INGLIS" Turbine Pumps are Hydraulically self balanced and as an auxiliary a liberal water cooled marine thrust type bearing is used.

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Wooden Water Pipe

Galvanized Wire Wound and Continuous Stave Pipe for Water Works, Power, Irrigation, etc.

Withstands 250 lb. working pressure.

Not affected by Frost, Corrosion, Electricity or Acid. Water Works Systems installed. Prompt attention to inquiries.

Write for prices.

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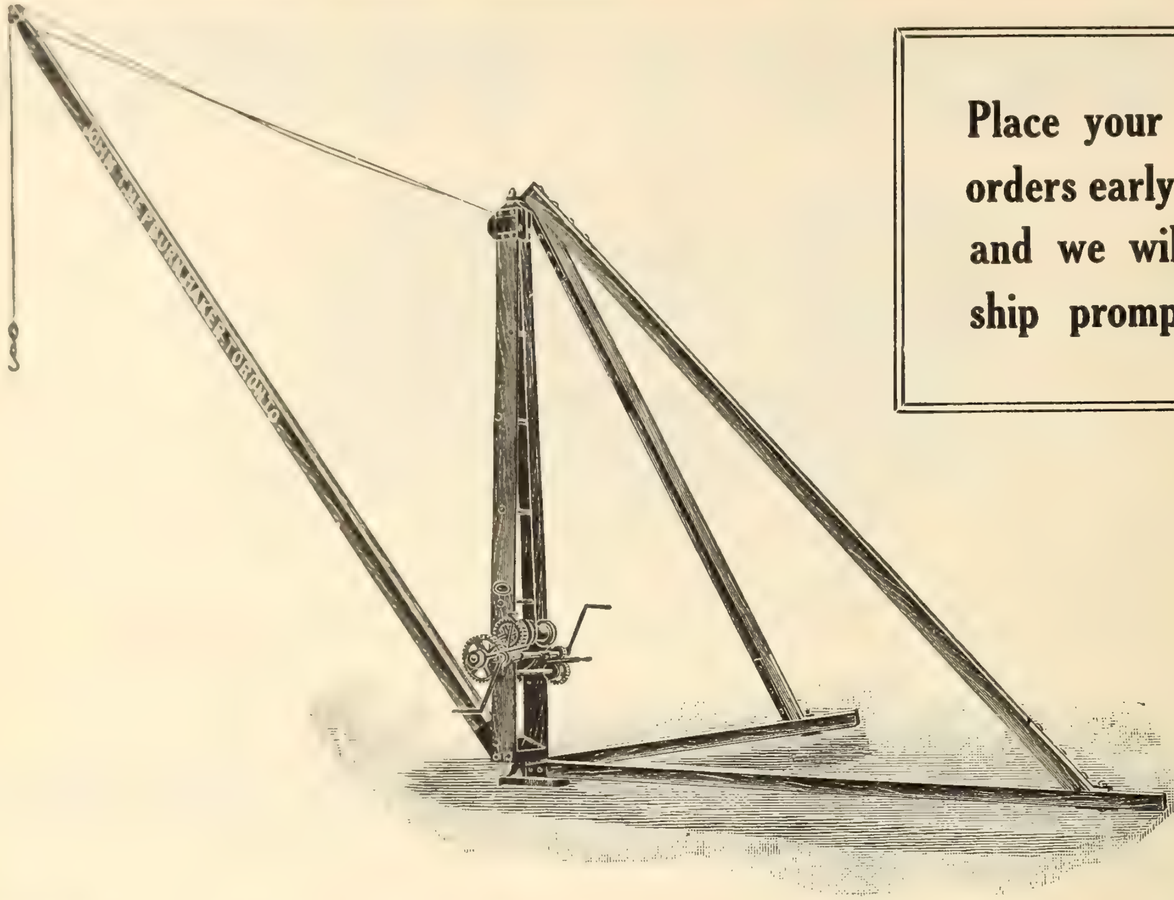
Canadian Pipe Co., Limited

P.O. BOX 915 **Factory: 550 Pacific St., VANCOUVER, B. C.**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and we will
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with
Hepburn Scotch Derricks

These derricks are simply and substantially built and will handle your building materials more quickly than any other derrick. Hepburn Scotch Derricks are correctly proportioned with weight where it is necessary.

Made in standard sizes—one-half ton upwards. Interchangeable parts kept in stock for prompt shipment. Operated by hand or power. Fitted with single and double-purchase gears, band brake, and high-grade wire heaving rope. Interchangeable parts always in stock.

We are also makers of electric and hand overhead Travelling Cranes, Travelling Jib Cranes, Winches, Structural Steel Work, Brick-making Machinery and Iron Castings of every description.

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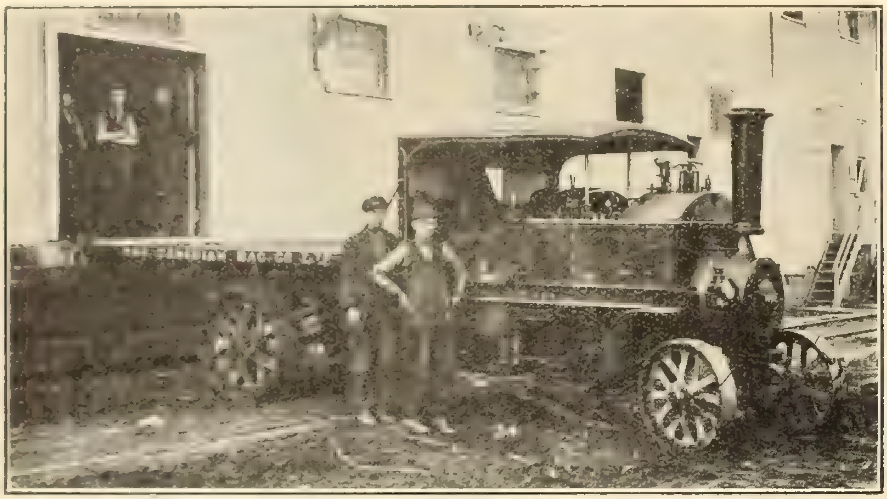
Foden Patent Steam Truck

The most up-to-date, economical and reliable method of hauling Brick, Sand, Stone, Structural Steel, etc. up hills and over rough roads.



Various types of bodies may be fitted to trucks to suit conditions

"Foden" 6 ton trucks at work in Montreal.

The upper cut illustrates a Lorry type and the lower a Tipper.

Note inexpensive steel tyres 12″-14″ face.

20 sold in Canada last year and **21** at present on order including repeat orders.

Independent of gasoline which is soaring in price; dependent only on **Coal or Coke, and Water.**

We stock repair parts.

Unloading face-brick by hand—Box partly dumped. For unloading ordinary brick, stone, sand, etc., box may be fully dumped, mechanically

Fodens Ltd. are the oldest and largest manufacturers of Steam Trucks in the world.

We have Foden Trucks now running in Montreal, Toronto, Winnipeg and Vancouver.

Write for Catalogue and particulars, and to insure Prompt Delivery, Order Early.

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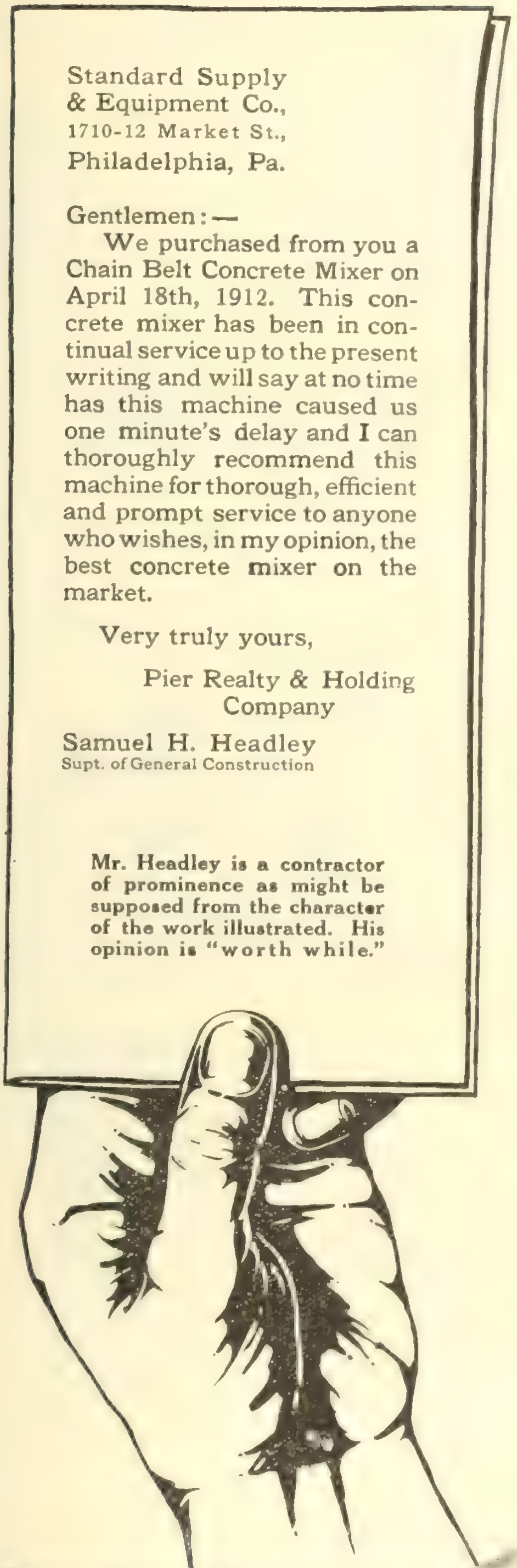

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Gentlemen:—

We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding Company

Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

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There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

MILWAUKEE, WISCONSIN

Dominion Equipment & Supply Company,
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Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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In our salt glazed vitrified sewer pipe we offer the highest type of sewer material. Pipe of our manufacture have been used in practically every city in Canada. Highly glazed and perfectly vitrified.

If you are contemplating sewer construction we can quote you some attractive prices. We also make all classes of fire clay goods.

Prompt shipment on all orders.

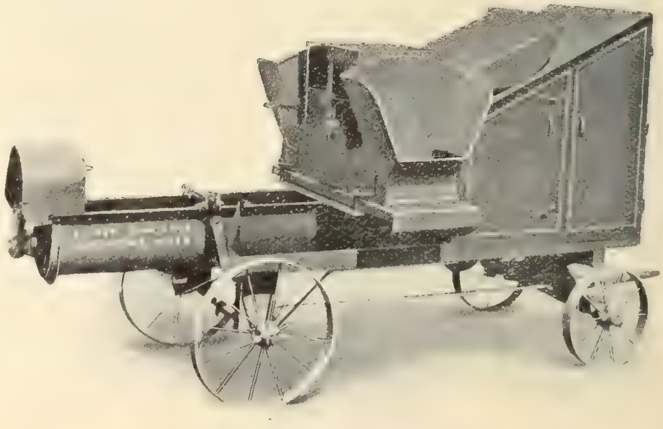
Standard Clay Products Limited

TWO SEWER PIPE FACTORIES: **St. Johns, P. Q. and New Glasgow, N. S.**

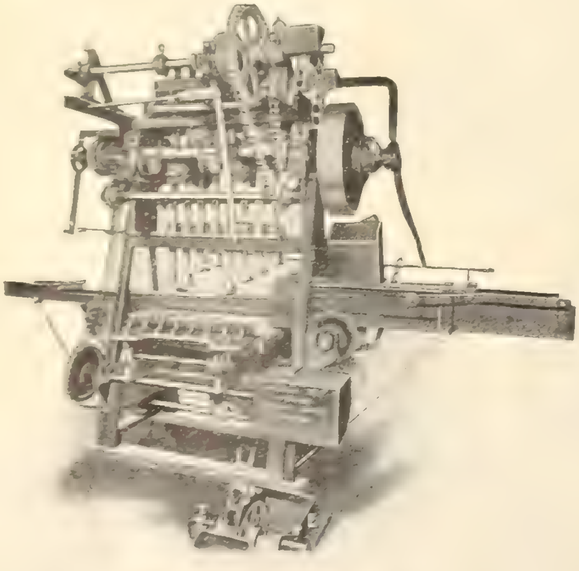
ALSO FIRE CLAY FACTORY AT ST. JOHNS, P. Q.

Cement Bricks

Here are the two Besser machines that make the best cement brick on the market. The Brick machine that will make 30,000 bricks per day—every brick the same.



Besser Simplified Continuous Mixer



Besser Power Cement Brick Machine

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Popular, because its deep uniform red shade is always the same and never fades.

1,000,000 bricks are on hand in our yards ready for immediate shipment.

Hamilton Pressed Brick is made from shale, rich in ironoxide and free from so called soda.

It has been used in many of the leading public buildings, schools and residences throughout Canada.

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A Belt Which Conveys ALL the Power

Practical men know the drainage of power from a slipping belt, ***and because they know,*** they are buying

GOODYEAR RUBBER BELTING

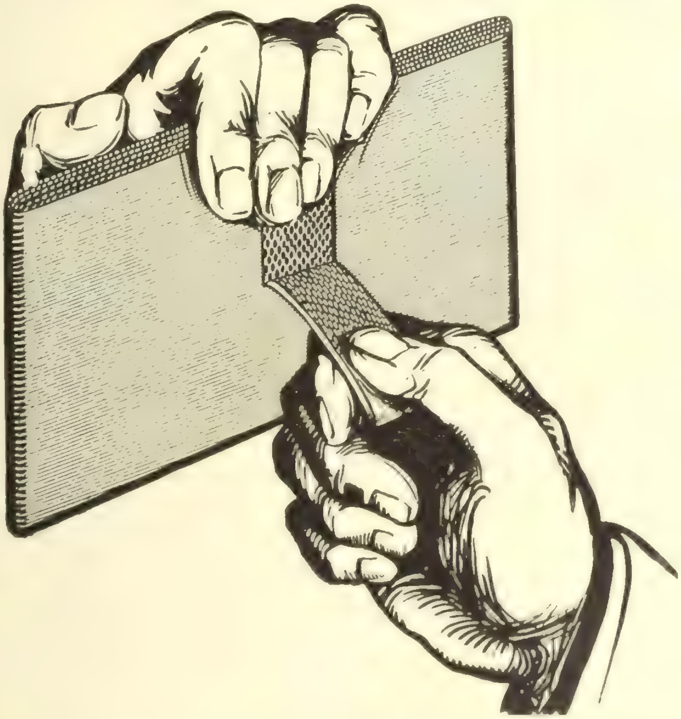
Which Neither Slips Nor Stretches

It is built up, layer upon layer, of close-woven, long-fibre, cotton fabric, rubberized and cured under Goodyear processes. And every Goodyear belt has in it the lowest possible minimum of stretch, because the belt is "cured" whilst stretched to the limit of safety in a special machine.

That is the Goodyear Method of Belt Manufacture

And the result is entirely satisfactory to belt users—a fact to which our enormously increased sales testify. What is the significance of this CONTINUED SALES INCREASE—50% over last year? Simply that Goodyear Belting more than fulfills the claims made for it by the Goodyear people—who know what a belt should do, and make a belt to do it.

It has cost us less than $200.00 for claims or adjustment of every kind in connection with our total output for the past two years—a remarkable tribute to Goodyear reliability.



Look into the Belt for Yourself—Try to Tear it Apart.

Make a cut in the top layer—and then try to pull it apart. You will get a faint idea of its strength.

That is the result of forcing rubber at a tremendous pressure through the fine cotton fabric—separating every strand—thus abolishing all internal friction or grinding. Whilst these layers of fabric are afterwards so compressed as to be almost homogeneous, the finished belt bends easily, the "duck" being so woven as to retain complete pliability in the finished belt.

For Main Drives and High Speed Pulleys GOODYEAR Belting is the Best

It has all the tensile strength necessary to absorb tremendous strain without slip, stretch or rent. The grip of rubber and the prodigious strength of hard-twist cotton fabric are united, and prove equal to every emergency.

Where the power transmitted is high, and great tensile strength is essential, Goodyear Rubber Belting proves its worth.

EVERY GOODYEAR BELT IS SUBJECTED TO A STRINGENT TEST BEFORE LEAVING THE FACTORY, and what is more, the materials used in the manufacture are also tested in the Goodyear laboratory before using.

IF YOU USE A BELT AT ALL IT WILL PAY YOU TO USE A GOODYEAR

Loss of power is loss of profit—and an inferior belt is dropping power all the time. Goodyear belting quickly earns its cost in power saved and trouble avoided.

TWO HUNDRED AND FORTY ROLLS A TOTAL OF 72,000 FEET

We have just received an order for this quantity of GOODYEAR RUBBER BELTING from one business concern in the west for the equipment of interior elevators. Such an order shows supreme confidence in the quality of GOODYEAR Belting.

If we have not just the belt you require we will make it for you.

In the choosing of belts our booklet would be of great assistance to you. We supply it free. Write to our nearest branch for one.

The Goodyear Tire and Rubber Company of Canada, Limited

Factory, Bowmanville, Canada

BRANCHES: Victoria, B. C. Vancouver, B. C. Calgary, Alta. Regina, Sask. Winnipeg, Man. London, Ont. Hamilton, Ont. Toronto, Ont. Montreal, Que. St. John, N. B.

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Hoisting Engines
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Steel Scows
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Centrifugal Pumps
Drill Boats
Steel Derricks, Etc.

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Ask for name of customer nearest you. We can safely refer you to him.

Tell us what you need in the way of Excavating or Material Handling equipment.

Our experience and facilities will enable us to interest you.

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A Stucco Uniform in Texture

J-M Asbestos Stucco, being composed of Asbestos (which consists of ground asbestos rock and fibres), combined with Portland Cement, forms an exterior finish which is uniform in texture. This stucco also possesses elasticity, which prevents chipping, cracking and crumbling.

Residence of Mr. J. S. Stehlin, Long Beach, L. I. Covered with J-M Asbestos Stucco. Kirby, Pettit & Green, Architects.

J-M ASBESTOS STUCCO

dries a pleasing permanent, uniform color that does not tarnish or discolor with age. Water or the most severe climatic changes do not affect it.

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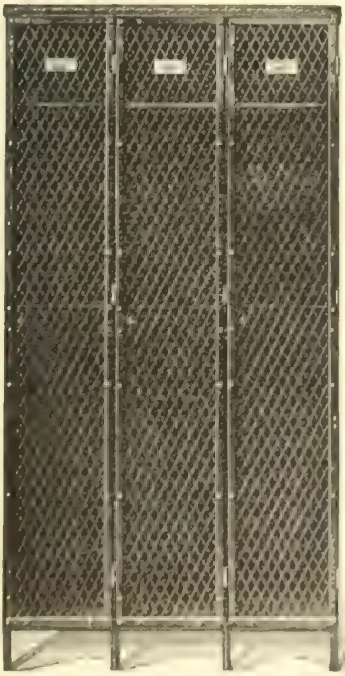

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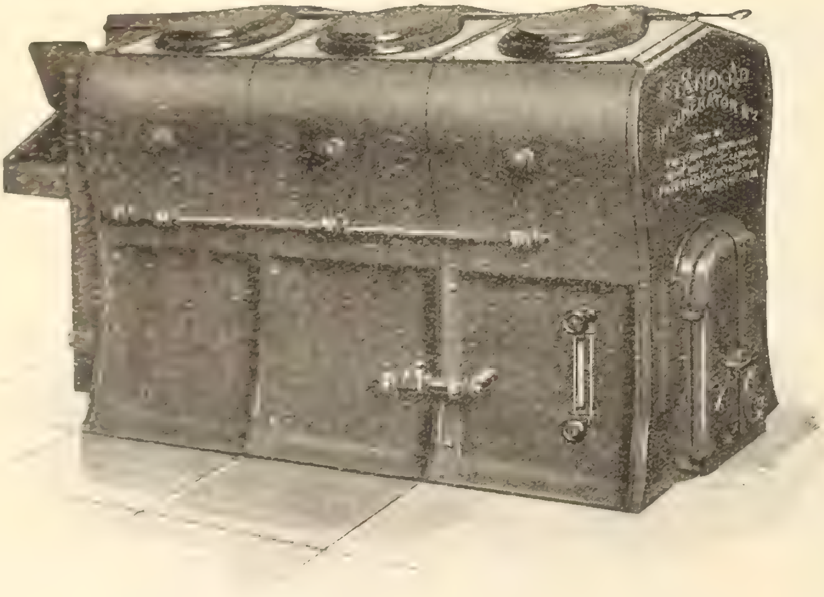

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Municipal Appointments

IN many way the present system of municipal appointments is faulty. It is always the case that appointments made by irresponsible parties are more or less open to suspicion. An individual in private practice exercises the greatest caution in choosing his employees, for on them depends to a great extent his profit or loss for the future. On the other hand the average council is supremely uninterested—except at election times, in keeping the rates down, and therefore often allows personal motives to take the upper hand in the choice of officials. Political animus, favoring of personal friends, either of these motives may be the deciding point in the filling of the position. And thus the qualified man is thrust aside in favor of some ignoramus who has "influence at court."

It is for the certified municipal engineer to find a way of protection against such injustice. At present there is no department to protect him and he is left entirely at the mercy of local bodies. His wage is often small, his hours elastic, and woe betide him if his sense of duty compel him to run a tilt against the ideas of any of his council. It is but a simple matter for them to give him short shrift and refuse a testimonial

The engineer's only hope lies in combination. Every member of the profession should belong to some society, and the societies should work together for a common end. They should form a joint committee and by unanimity of opinion and dogged perserverance get their authority recognized and achieve a legal right to have a say in the matter of municipal appointments

The Duty and the Opportunity of the Designer in Connection with the Operation of His Plants

WHILE the public is now fairly appreciative of the values of engineering service in connection with the design and construction of works of a certain character, it does not yet realize that the efficient operation of works designed by the engineer often calls for a grade of technical knowledge quite as high as that required in designing and building the works. The failure of the public to appreciate the importance of this phase of engineering not only narrows the field of the engineer's activity but also tends to nullify much that he has accomplished as a designer and builder. In following the engineering work done throughout the country the editors are convinced that many engineers are on a par with laymen in their conception of the full functions of the engineer. In a recent discussion before an engineering society meeting a member cited a case which will serve well to illustrate the desirability of a wider appreciation among engineers of the true scope of engineering. An engineer designed a hydro-electric power plant, supervised its construction and then considered his work finished. He went about his business and the following year he designed and built another plant similar to the first. The next year a third plant was built by the same man. In all three plants the conditions were practically the same and the designs adopted were the same except as to size.

Shortly after the first plant was put in operation it became necessary to make certain rather expensive changes in it in order to get the cost of operating down to a satisfactory figure. This change was made befort the second plant was built, but the designer was not in touch with the situation and did not know that his first plant contained faults which unduly increased its cost of operation. Accordingly in building the second plant, and later on the third plant, he repeated the mistake made on the first plant.

There is a two-fold lesson to be drawn from this incident. First, engineers should not build plants or structures and then fail to follow their subsequent history to see whether or not they rendered satisfactory service. Both for his own future guidance and for the benefit of his future clients, the engineer should keep a line on the performance records of his past designs.

The second lesson to be drawn from the case mentioned is that works which are built by engineers should, in general, be operated by engineers. The consistent amount of expert attention to the routine affairs of the plant's operation will, of course, vary greatly between various cases. The designing engineer should preferably be retained to supervise the operation of his plants. Not only does he know the details of his plants perfectly, but he has a strong incentive to put forth his best efforts to make them operate at their highest possible efficiency.

We have said that the amount of attention which the expert can consistently give to the details of plant operation will vary greatly between different cases. Further, in saying that the designer should have charge of the operation of his plants we do not mean that he should look after small matters of a routine nature, but that he should act in an advisory capacity with reference to plant management. He should study the records of the plant to see wherein economies [illegible] be instituted in operation. Having [illegible] the complete records of several plants, the knowledge gained from the study of the performance of any one plant thereby becomes readily available for the use of all other plants under the same general management.

There is a growing tendency among engineers to regard plant operation as one of their legitimate fields of service. All engineers should now realize that complete engineering service embraces the general supervision of plant operation. This applies especially to small plants where the man put in direct charge of operation knows but little about the "fine points" of the design of the plant or about the sciences upon which its existence is based. This is especially true of small sewage plants. As we stated in a previous editorial, the designers of such plants should keep in close touch with their operation in all cases. The same holds true for small water works systems, hydro-electric developments, electric light plants, etc.

If engineers will cultivate this phase of their profession they will not only become better qualified to serve as designers and builders, but they will also have numerous and important additions made to their sources of income.—Engineering and Contracting.

Does It Pay To "See" a Man?

THE average man whose business lies considerably out of doors experiences increasing difficulty in "seeing" the heads of firms—particularly architectural firms. Most of us can recall unpleasant occasions upon which we have called to see some great man—in the guise of a local architect—who has made us feel how really small and insignificant are all those who stand without the pale of the profession proper. Of course, on the other hand, one can call to mind many of the more progressive generation who are prepared to give a few minutes to every caller provided that he states his business clearly and concisely and be prepared to take "no" for an answer. But the other genus preponderates—the high and mighty rajah of the draughting domain who has no consideration for anybody but for him who presents himself with a sacrice in the shape of a fat commission. We wonder how soon it takes the greater percentage of these "big men" to realize that they are not big men at all—that they are little men with a little outlook, a little sphere of operations and a little—very little—prospect. We know many architects, both great and small, and we are persuaded that it is the little men who shut themselves up within the narrow confines of their office and refuse to see anybody outside of their regular clientele—that is, where they possess one. The inner sanctum of these men is taboo to the man who is looking for technical information, to the contractor and to the salesman.

That in many cases those who are numbered in the ranks of the latter class have forgotten more of useful business experience than the architect ever dreamed of in his most practical flights of imagination, carries no weight. The fact that nothing in their hand they bring —but a note-book—condemns them without a hearing. The journalistic man may desire technical information for an article which will bring much credit to the architect; the contractor may be a man of means, experience and influence; the salesman may be handling a specialty of untold merit—all to no purpose with the architect of the shell variety whose progress is consistent with others of the species.

That this attitude on the part of our reticent architectural friend redounds occasionally to his disadvantage is shown rather neatly by Chas. E. White, Jr., who gives the following experience in Building Progress:

In an Eastern city a few weeks ago a business man called upon a certain young architect (whom he had not met) on a matter that might prove extremely advantageous to the latter. He had no cards with him, nor did the stenographer ask his name. "Mr. Johnson is busy," she said, after passing into the private office to consult her employer.

"Very well, I'll wait," replied the man.

Ten minutes went by—fifteen minutes, but there was nothing doing. In the meantime the impatient caller could hear scraps of conservation drifting through the open door. It was evident that Mr. Johnson had a friend with him, for an animated conservation on golf filtered through the open door.

After a delay of considerably more time the visitor was finally admitted to Mr. Johnson's presence. But he did not broach his business to the younger man. He decided that the man he needed for the work he had in mind must be a man of another calibre.

In another big city where several architects have gained world-wide fame, a quiet little man one day walked into the office of a well-known architect and asked to see him. "Mr. Rose is very busy," said the office boy. "Will any one else do?"

"No, I'd like to see him personally," replied the other. "Just ask Mr. Rose when he can see me." Evidently Mr. Rose could hear what was said, for "Oh, have him see me to-morrow," was heard in impatient tones from the open door of the private office.

When "to-morrow" came the quiet little man walked into the office of another architect. "I'd like to see Mr. Jones," said he in his quiet voice to the stenographer.

The stenographer vanished without question. "Certainly, sir," said he, and, reappearing, "Mr. Jones will be pleased to see you," said he.

When the quiet little man walked out from Mr. Jones' office he left with him a signed contract for plans, specifications, and supervision on a big country residence which the quiet man (treasurer of one of the largest corporations in the United States) was building for a permanent home for himself and family.

These are both true incidents, with the exception, of course, of the names. How many other architects, especially younger men, have made the same mistake?

One of the most successful architects I have ever met, a man of middle age who has been in business for forty years, has his office arranged in this manner:—directly from the outside corridor one enters into a little reception hall with a wide-open door (leading to the private office) just opposite the corridor door. Just inside this doorway, in full view of everyone who enters, stands the desk of the "boss." Any one can get to him at any time. There are no frills in this office. Every part is devoted to business—indeed, the business efficiency of this office is well known throughout the city, to clients as well as contractors.

I asked this architect if he lost a great deal of time talking to salesmen. "Certainly, sometimes," he replied, "but I discovered years ago that salesmen have as much to teach me as I have to teach them. It is to my interest and to the interests of my clients that I be kept informed of every new device used in building as soon as it appears. Salesmen who call upon me are of great assistance to me. They know, usually, all the gossip of the building trades—which offices are busy and which are not—who got such and such contract —and a thousand other things, not only of general interest to me, but often of genuine help."

"Mr. ——— wastes no time when he talks to salesmen," said this architect's stenographer when I questioned him. "He is so well known to all of them, and they are so pleased at the ease with which they can approach him, that they are careful to state their business quickly. I have no doubt," he went on, "Mr. ——— is better known to hundreds of contractors in this and nearby cities than any other architect. Much of his business comes through the influence of these same contractors, who often recommend him to prospective owners. Clients like to do business with him, too, and when it comes to draftsmen, they love him like a father; they will do anything for him."

As pointed out in the article in our last issue, dealing with the suppression of technical news, if everybody adopted the policy of withholding information, live technical journals could not be published, and surely this would be a serious check to professional progress. The men who "do not care to give out any details" are a dead weight in the forward march, and the sooner they are dropped the more rapid will be the progress.

This is the day of the average man. It is the day of the worker, who is entitled to consideration—and those who are really great accord it the most readily.

We contend that something should be left to the discrimination of the caller. By all means let the chief clerk or principal assistant attend to those whose business is of a routine nature, but extend personal consideration to the man who estimates his personal business of sufficient importance to request a personal interview. The whole matter may appear trifling to the man of importance, but we are persuaded that it is a factor of increasing importance in the constructional field.

The Artistic in Engineering Work

A recent lecture before the Royal Society of Arts, delivered by the distinguished etcher Joseph Pennell, whose sketches of the work at Panama aroused such interest last year, awakens the mind again to the possibilities of enduring beauty that may lie in engineering structures devoted to strictly utilitarian ends. Too often such things are uncompromisingly ugly and while they may at times realize the Socratic ideal of beauty that ideal has never been wholly convincing to the modern mind. It is doubtful whether even Mr. Pennell, with his keen perception of the picturesque features of human activity, could hold that structures are necessarily beautiful merely because they are adapted to fulfill the ends for which they were designed.

In truth, many of the admirable etchings by Mr. Pennell used to illustrate his lecture are indeed effective pictorially, but admirable merely because they are technically well conceived illustrations of the hideous. They are impressive representations of powerful though unbeautiful things, in the same way that a book or a play may be an admirably constructed and splendidly adequate representation of the utterly horrible or the loathsomely impossible. In the last analysis the things which seem to have gripped the artist in his study of the picturesque possibilities of works and workmen are the huge and crude manifestations of elemental power which do not always, or indeed often, harmonize with the finished and scientific work of the engineer. It is this insistence on the idea of crude and brutal power that gives force to Mr. Pennell's drawings. The great sweep of the old Dutch windmills, with their big and powerful forms, appealed to Rembrandt just as to his successors, but it would take a clever artist to find the same compelling elements of picturesque power in a modern scientifically designed windmill of ten times the power and efficiency of its Dutch prototype, but lacking the mighty sweep of wing and roughness of contour. Similarly, Mr. Pennell's glorified conception of the grimy picturesqueness of a great works would disappear if the artist were brought face to face with a modern power house using skillfully planned furnaces giving smokeless combustion and working, without towering chimneys, under forced draft. A boiler-room equipped with modern automatic stokers altogether lacks the so-called artistic possibilities of the plant of the old fashioned kind with glowing furnace doors casting lurid beams of light through a hazy atmosphere and throwing distorted shadows of the half-naked fireman on the dingy walls. One cannot help feeling that clever as the artist has been the thing which he has grasped as picturesque has as its basis the realization of tremendous activity and power but depends almost wholly upon the appearance of crude though awe-inspiring elements.

The task of the skilled engineer, lending something of beauty to his works of utility, is a very different one. He does not build tall chimneys, needlessly to belch out huge masses of smoke against the sunset sky. He does not build a superlatively great steam engine with slow majestic sweep of connecting rod and deliberate revolution of gigantic fly wheel when a steam turbine delivering 10,000 kw. as from a sleeping top would do the work far better. His task is to get maximum results with as little of flamboyancy as possible. Whether in building a dam, a power house, or a machine, it is the engineer's business to adapt it as completely to its uses as he can, and while this may fulfill the Socratic ideal of beauty it sometimes misses every other. Possibly this is the very reason why Leonardo da Vinci, perhaps the most accomplished engineer of the middle ages, as well as one of its greatest artists, consistently avoided mixing his engineering and his art.

There is, however, much to be said for greater attention to beauty in engineering works. It is not necessary for a factory or a power house or an office building to be uncompromisingly ugly—as indeed Mr. Pennell has shown most admirably in his appreciation, for example, of the huge buildings which tower along the sky line of New York as seen from the harbor. Some of them to be sure are anything but beautiful, but others despite their utilitarian purpose are full of charm. We have not gone so far yet in improving the design of more utilitarian buildings than these, and still there are here and there structures which show well what might be done. One calls to mind, for instance, a factory originally perhaps garish enough but altogether redeemed by its ivy-clad walls and its surrounding greensward. One calls to mind, too, dams which are, even without the glittering sweep of the water over the crests, structures of graceful contour, displaying not only power but elegance. There are power stations, too, of which the ensemble is beautiful from the architectural standpoint and the setting in the landscape all that could be desired. We do not yet think enough about such possibilities in this country; but they can well be realized, and while Mr. Pennell's lecture bears more directly on the picturesque element of things as they are for the purposes of the artist, it ought to serve as an inspiration toward making engineering works need less of the artist's cooperation to make them beautiful.

Notes on Design and Construction in Ferro-Concrete Work*

By Richard H. Osler, A. M. Inst. C E.

As so many books have been written already on the theory of ferro-concrete design, the author proposes only to mention very briefly various points that must be considered by the engineer in his design and the subsequent carrying out of his work.

All calculations must be based on formulae of an empirical nature, partly deduced from a knowledge of the strength of the two constituent materials, and partly from the special knowledge acquired in the design and construction of a large number of structures. The pioneer stage has been left behind, and nowadays problems can be attacked with a very much greater degree of confidence than was the case even five years ago, with the result that engineers recognize that ferro-concrete has come to stay, and realize why our cousins on the other side of the "herring pond" have been so interested in this form of construction for several years past. England is, as a rule, last to take up a new invention, but when she sees, from the experience of others, that there is something really worth while taking up, then she goes ahead wholeheartedly, and is very soon abreast of the leaders.

The concrete employed is invariably made of the best Portland cement, clean sharp sand, and an aggregate of good, hard, durable stone broken to ¾ in. to ¼ in. gauge, or else, if obtainable, good, clean river or other gravel. It is most important that the cement employed should not be too "quick-setting," and the author insists that the initial set shall take place in fifty to ninety minutes, and not before, so as to avoid any initial set taking place whilst the concrete is being brought from the mixer or platform and whilst it is being deposited and rammed in the forms. In mixing the concrete great care should be taken in adding the water very gradually, so as not to wash away the cement from the sand and aggregate, and the resulting mixture should quake when turned over by the shovel. Although in laboratory work, a dry mixture will often give the best results, and for that reason engineers on earlier works insisted on the concrete being made as dry as possible, yet in practice, where the structure is exposed to the elements, it is found that a medium mixture is not only very much more easily worked, but strips very much more cleanly and the human element in mixing and depositing is to a great extent discounted.

Problems of Reinforcement

Now when considering the reinforcement, it is obvious that if it were practicable to place the steel as theory teaches us it ought to be placed, then there would be a great number of very fine steel wires receiving and transmitting stress throughout the structure. In practice, however, this condition of things is quite out of the question, and in the Hennebique system the happy mean has been adopted, viz.: moderately small bars as the reinforcement, small bars and thin steel flats bent in the form of stirrups for auxiliary reinforcement. Mild steel is the only form of steel adopted, as it has been found that much more uniform results have been obtained by employing this material, as the material itself is more uniform as regards tensile strength, especially when it is being supplied by a number of different rolling mills.

There are at the present time various forms of patent bars on the market, some manufactured with the idea of creating a mechanical bond between the steel and concrete, and others with the idea of doing away as much as possible with the human element in placing the steel, by manufacturing the bars with the auxiliary reinforcement at certain fixed points.

As to the first, it has been proved by various experiments in this and other countries that no mechanical bond is necessary, owing to the natural bond created by physical and chemical agencies. As to the latter, it is obvious that it must be correct to place the reinforcement in those places and in those places alone, where in theory it is shown to be necessary. In using fixed reinforcement it is impossible to vary the auxiliary reinforcement, so that the stirrups are placed in those positions which the stress diagram requires.

It is considered good practice in this country to make no allowance for the resistance to shear in the concrete. If the concrete in shear is to be stressed to over 60 lb. to the square inch, the margin of safety is likely to be very small.

Provision for Shear Stresses

In the Hennebique system sufficient provision is made for the shear stresses: (1) by the bent-up ends of the main bars, which lie fairly across the most likely lines of rupture; (2) by the stirrups, which can be spaced accurately according to the stress diagrams; and (3) by the ends of the stirrups being bent over at right angles, forming a very rigid anchorage in the concrete, and which have been proved to form a perfect connecting link between the compression and tension areas.

Now leaving the question of design, the author will deal with one or two general questions which affect the engineer and the public at large very closely. First of all, it may be asked, what is known of its durability?

Certainly ferro-concrete as at present constructed is a compartively new material, and sufficient time has not elapsed to enable the engineer to answer this question accurately, but if past results are worthy of consideration, in which somewhat similar materials were used, then we can safely predict that ferro-concrete will outlast any other form of construction.

Every engineer knows that lime concrete employed by the Romans has endured to the present day, and that iron embedded in the same variety of concrete has been preserved for at least one thousand years without showing traces of corrosion. Naturally we believe that Portland cement, as scientifically prepared and tested at the present day, is much more durable than the lime concrete, and it is reasonable to suppose that our structures will last at least as long.

Maintenance is another highly important question which must be considered by engineers.

The engineer in steel construction has to face the fact that his works must depreciate year by year in spite of costly maintenance charges, and after a few years these latter frequently represent a sum almost equal to the original cost, and it may be said for ferro-concrete that the first cost is the last cost, if properly designed and constructed.

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* Abstract of a paper read before the Birmingham (Eng.) Branch of the Institution of Civil Engineers.

A Method of Proportioning Cement

THE new "Specifications for Concrete and Concrete Materials and Mortar and Mortar Materials," recently issued by the U. S. Navy Department, contains an interesting method of proportioning concrete, indicated in the following extract as "Method B":

Method A

(Fixed volumes of sand and stone.)

(a) Mass concrete (1:3:6).—Foundations for buildings, including wall foundations, column piers, curtain walls, retaining walls in earth, abutments, wall footings, concrete foundations, and mass concrete similar to these shall be composed of one part cement (allowing 100 lb. to the cu. ft.), three parts by volume of sand, and six parts by volume of broken stone or gravel.

(b) Reinforced concrete (1:2:4) in columns, beams, slabs, walls, etc., shall be composed of one part cement (allowing 100 lb. to the cu. ft.), two parts by volume of sand, and four parts by volume of broken stone or gravel.

Methods B

(Fixed volume of stone and variable volume of sand.)

(c) Proportions of concrete under Method B, which is to be used only when specially required by the specifications for the work, shall be as follows:

Class A.—One part cement (allowing 100 lb. to the cu. ft.) to six and one-half parts by volume of broken stone combined with a variable proportion of sand.

Class B.—One part cement (allowing 100 lb. to the cu. ft.) to four and one-fourth parts by volume of broken stone combined with a variable proportion of sand.

(a) Determining amount of sand—It is the intention with the given amounts of cement and broken stone to secure concrete as dense as possible. The amount of sand accepted during the progress of the work. The proportion to be added will therefore depend on the actual character of the sand and broken stone, and the number of cubic feet of sand to be added will be determined by frequent experiments and tests of the material as actually delivered and will be established from time to time for each class of aggregate used and will not be changed during any period of 24 hours, unless the contractor desires to use materials of different characteristics, and the proportion determined at any one time shall continue to be used until the next determination is made and the contractor has been ordered to change the previous proportions.

(e) Tests for amount of sand shall be conducted as follows: To a mixed volume (not less than 5 cu. ft.) of dry stone, which shall be a representative sample, add a fixed volume of dry sand. Mix these very thoroughly, so as to fill all the voids as uniformly as possible, and then measure and weigh the resulting mixture. Repeat the experiment with varying amounts of sand. That proportion of sand which gives the heaviest mixture per unit of volume shall be used in preparing the concrete. The labor and materials for the experiments shall be furnished by the contractor.

(f) Run of crusher stone—The specifications elsewhere require the screening out of particles of broken stone and gravel below 1-5-in. in size. Under "Method B" of proportioning materials, this will not be necessary if it can be shown by tests that the amount of fine material remaining in the stone or gravel is such that with the addition of sand the resulting total of fine material below ¼ in. size will be at least equal to the most suitable grades of natural sand. Tests must be made to determine that there is not an excess of fine material beyond that required to give the densest possible aggregate. Permission to use run of crusher stone as described in this paragraph must be previously obtained from the officer in charge of the work.

An article in De Ingenieur describes the cleaning of a 12-inch water main five miles long in the Hague, by means of a machine consisting of a small turbine driving four revolving blades, and operated by water under a head of 65 feet. The improvement effected may be gauged by the fact that nearly four tons of material were removed from the interior of the main. Only three stoppages occurred during the operation of the cleaning machine. One was caused by a small piece of lead encountered, another was due to the catching of a spring, and the third resulted from reduction of pressure near one of the socketed joints.

Calking a steel cofferdam was carried out in connection with the foundations for the west rest pier of a bridge which crosses the Passaic River at Newark, N.J. The cofferdam, 15 x 83 ft. in plan, consisted of a single line of 2 in. 40 lb. Lackawanna steel sheet piles, 35 ft. long, driven by a heavy steam hammer through 9 ft. of water and 6 ft. of mud, into a stratum of hardpan and boulders. In some cases the boulders had to be removed by excavating or blasting before the piles could be fully driven. An attempt to unwater the cofferdam by a 12 in. centrifugal pump was unsuccessful on account of leakage through the pile joints. The interlocks were filled with sand and the pumping resumed. This lowered the surface of the water in the cofferdam about 25 in., when the sand was blown out of the joints and pumping was discontinued. Finally the joints were all calked with oakum rammed down from the top to a depth of about 25 ft. by thin steel rods. This operation took six men about two weeks and proved efficient.

A New Gould Story

George Gould was making one of his last trips as president of the Missouri Pacific. His private car was laid out on a siding for some reason or other, and he got out to stretch his legs. An old Irishman was tapping the wheels. Gould went up to him.

"Morning. How do you like the wheels?"

"Not worth a darn," said the Irishman.

"Well, how do you like the car?"

"It's good 'nough for the wheels."

"What do you think of the road?"

"It matches the car."

Gould looked at the old chap for a minute.

"Maybe you don't know who I am."

"Yes, I do," retorted the Irishman. "You're George Gould, and I knew your father when he was president of the road. And, by gob, he's going to be president of it again."

"Why, my father is dead," said Mr. Gould.

"I know that," replied the Irishman, "and the road is going to hell."

Sand vs. Concrete Foundations for Brick Pavements*

IN commenting on the relative economy of using a sand or concrete foundation under a brick pavement, the chief items to consider are first cost, maintenance and life. In the following discussion of these three items the experience of the Department of Public Service of the City of Cleveland, with Cleveland streets, is used principally.

Many of the city's streets are located in a sandy territory, in which it has been possible to lay pavements without bringing to the work from elsewhere any sand or gravel ballast. It has been the practice in such localities to prepare the bed of the pavement by means of the customary puddling, rolling and shaping, and laying the brick immediately upon the foundation thus prepared. In other sections of the city the streets are in a clay soil, and still others show an outcropping of shale or rock, to all of which any sand or gravel ballast or cushion must be brought.

Paving brick five inches in depth have been used to a large extent. This depth was adopted so as to ensure a block of adequate strength in itself, and also on account of the greater surface thus exposed for the adhesion of the cement grout filler. This has been thought specially advisable on sand foundations. But few brick pavements, and these in alleys and very light traffic streets, have been laid with four-inch paving brick, unless in connection with a concrete foundation.

Where the sand or gravel ballast must be brought upon the street, as in the case of clay soil, it is usual to specify such foundation to be eight inches in thickness. This depth of ballast, in conjunction with the five-inch depth of brick, requires extra excavation, which must be taken into account when considering comparative costs.

The cost of maintenance of a pavement, referring to repairs and not to street cleaning, must always be a very indefinite item. It depends entirely upon the standard of condition in which, according to someone's judgment, the pavement is to be kept. Very seldom can the repair and relaying of pavements be handled in the manner which theory indicates as advisable. Practical conditions, such as property owners' protests or petitions, available funds or popular demand, are generally the ruling factors, and it is on this account that the records of the older cities regarding the time that has elapsed between the laying and relaying of pavements are really the best and most available evidence.

It is with this idea in view that the records of the Cleveland Paving Department have been drawn upon for evidence relating to the subject of this paper.

The city first began to lay brick pavements in 1889, and has continued doing so ever since, until at present there are about 328 miles of streets paved with brick, subdivided as follows:

257.61 miles of 5-inch brick on sand foundation.
19.39 miles of 5-inch brick on concrete foundation.
39.17 miles of 4-inch brick on concrete foundation.
11.84 miles of 4-inch brick on sand foundation.

The prices paid for brick pavements have varied from $1.18 per square yard to $2.48, depending upon the various forms of foundation and size of brick used.

The following table, indicating the various paving combinations employed in Cleveland for brick pavements, shows the yearly average maximum and minimum prices paid per square yard since the year 1900. Cost of excavation assumed at $0.50 per cubic yard is included as measured below the top of the paving brick.

	Minimum.	Maximum.
5-in. brick laid on natural sand foundation...	1.18	1.56
5-in brick laid on 8-in. sand or gravel ballast.	1.40	1.87
5-in. brick on 6-in. concrete foundation	1.94	2.48
4-in brick on 6-in. concrete foundation	1.71	2.34
4-in. brick on 4-in. concrete foundation	1.47	1.73

The prices paid for the various combinations seem to rise and fall in the same years, which would indicate that the variations depended upon the material and labor market and not on the difference in combination.

The earlier of the brick pavements consisted of small blocks of fire clay, four inches in depth, laid upon a natural sand foundation. Some of these are still in use, though they have served to take the traffic of residence streets for twenty years. In other localities, partly on account of traffic conditions, brick pavements on sand foundations required relaying in less than fifteen years.

No pavements of brick laid according to recent specifications and practice, nor any laid on concrete foundations, have been in existence long enough to cause any thought of relaying.

In reference to the brick pavements that now require relaying, having a condition where any adequate repair would prove far too expensive, it could probably be shown that other defects, such as improper filler, poor brick, or defective construction, had as great an influence in causing deterioration as did the sand foundation.

Cleveland has stone pavements laid upon a natural sand foundation, which have been subjected to heavy traffic for over twenty years and are still in good condition. Such streets, it must be remembered, are in a sandy, gravelly soil, in well built up and well drained sections, so that the effect of frost in the subsoil is reduced to a minimum. An entirely different condition would probably be found in an open and poorly drained clay district.

In considering, then, the relative economy of sand and concrete foundations for brick pavements, experience will show that a properly laid pavement of five-inch brick on a sand foundation will have a life of at least fifteen years, if laid in residence or light business traffic streets. A four-inch brick under similar conditions would probably have a life of three or four years less.

The problem is to compare the cost of such a pavement with one laid on a concrete foundation, the actual life of which has not yet been determined by experience.

Referring to the cost data given herein, the following prices are obtained as the average for the last three years, therefore expressive of existing conditions:

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* Abstract of paper presented at the Cleveland meeting of Section D of the American Association for the Advancement of Science, by Robert Hoffman, M. Am. Soc. C. E., Chief Engineer, Department of Public Service, Cleveland.

	Per sq. yd.
5-in. brick laid on natural sand foundation	$1.27
5-in. brick laid on 8-in. sand or gravel foundation	1.58
4-in. brick laid on 4-in. concrete foundation	1.60

Assuming a fifteen-year life for the five-inch brick pavement on a natural sand foundation, and the interest to be paid as four per cent., it will require a payment of nine per cent. per year to pay interest on the cost of paving and to provide a fund for its renewal at the end of fifteen years. This means an annual payment of nine per cent. of $1.27 or $0.1143.

In order to compare this with the case of a four-inch brick pavement laid upon four inches of concrete, the same annual payment of $0.1143 must be assumed. Deducting four per cent. of $1.60, the cost of such a pavement, for the interest charge, or $0.064, leaves $0.0503 to be applied per year for amortization. This amounts to a little over three per cent., and according to amortization tables would require a period of twenty-two years to provide the renewal fund.

In other words, the pavement upon the concrete must have a life of twenty-two years in order to be as cheap as the one upon the natural sand, having a life of fifteen years.

Comparing the cost of the five-inch brick upon a ballast of eight inches of sand or gravel with the brick upon four inches of concrete, it is readily seen that the difference is so small that both could have the same life at the same cost per year. Evidently then the concrete foundation is as cheap as the other, and much more economical as the probability of longer life is much greater.

A four-inch brick laid upon a natural sand foundation would cost about $1.07 per square yard, using the same cost data as used for the five-inch brick. If such a pavement had a life of twelve years, with money at four per cent., it would require an annual payment of about eleven per cent. or $0.1177.

Comparing this with four-inch brick on four inches of concrete, one sees that the latter would be equally cheap per year, if the life of the pavement were about twenty-one years.

It can similarly be shown that the five-inch brick would be as cheap as the four-inch, if the life were three years longer.

Similar calculations will show that a four-inch brick laid on six inches of concrete will be as cheap as four or five-inch brick on the eight-inch sand ballast, if its life is eighteen years.

From this method of reasoning, it may be concluded that where a natural sandy foundation under good condition is found, it will probably be as economical to lay a brick pavement without a concrete foundation as with one, and the first cost will be considerably less. In other locations, however, where it is necessary to bring upon the work from elsewhere the sand or gravel ballast, the first cost will be nearly as great, and the pavement with the concrete foundation will ultimately prove the more economical.

Several other matters must, however, be given consideration when passing judgment on this question. In Ohio, for instance, the municipality, though paying only a relatively small proportion of the cost of the initial pavement, namely, the part laid in street intersections and two per cent. of the remaining part, must pay fifty per cent. of the expense of relaying any pavement. It is therefore decidedly to the advantage of the municipality that a pavement be so laid that its life be as long as possible, so that the relaying expense shall come only at long intervals.

That an unyielding sub-base, such as concrete affords, is highly desirable goes without question, and it should be supplied wherever possible, and in most cases will prove more satisfactory, even at slightly greater cost. Concrete will carry the pavement load over the many soft places caused by street openings prior to paving and will prove a greater factor of safety against settlements and irregularities liable to occur where no concrete is employed. Any settlement in a pavement foundation breaks the bond of the brick and will be rapidly followed by serious deterioration.

Another possible economy in supplying a concrete foundation may be found in the possibility that some time it may be desired to replace brick with other kinds of paving material for which a concrete foundation must be supplied, such as wood block, asphalt or asphaltic concrete, in which event the cost will be materially lessened by reason of the existing concrete.

In open country with poor drainage facilities, there is no doubt that the damaging effect of frost and the yielding sub-soil would soon depreciate any brick pavement with only a natural soil foundation, and there concrete is the only safe and economical foundation.

The pavements in Cleveland that have lasted so well on sandy foundation, it must be remembered, are on streets supplied with adequate sewerage and drainage, the abutting lots being well built up and graded, so that water easily finds its way to catch basins and sewers, and all conditions are such that the heaving effect of frost is at a minimum.

Cleveland's greater mileage of brick on sand foundation is explained by the custom of former years. Improved concrete mixers and low cost of cement have made the use of concrete economically possible where in earlier years the cost would have produced a prohibitive tax upon the abutting property, and therefore is now employed to as great an extent as possible.

There is every justification, except in case of an abnormally high price, in so laying a pavement that it may be durable and serviceable. The interruption to business and traffic by reason of relaying pavements is difficult to value, but nearly always represents a large monetary loss. It is therefore entirely justifiable to make allowances in favor of a construction promising a longer life even though it may not seem theoretically the more economical.

Concrete for Artistic and Ornamental Construction

THE increasing use of concrete for all classes of construction has resulted in close study of methods of obtaining artistic quality in the coloring and texture of concrete products. Experiences in this class of work were discussed by Mr. Adolf Schilling, of Philadelphia, in a paper presented before the ninth annual convention of the National Association of Cement Users. The discussion has now been made available.

The two qualities of concrete stone, texture and dimension, so essential for its successful use depend largely, in Mr. Schilling's opinion, on close co-operation between the stone caster and the stone cutter. He states that for six years his concrete stone and natural stone plants have been under one roof and in his opinion these conditions greatly aided in procur ing a first class composite stone of proper size and finish.

In discussing methods of surface treatment, Mr. [illegible] recommends the adoption of methods similar to those employed in other lines of manufacture in treating objects. For example, in acid washing he suggests the advisability of immersing the article in a bath rather than applying the wash with a brush. This method of treatment not only results in a great saving of acid but produces a class of work that cannot be obtained with the scrubbing brush. A very weak acid solution is required and after the article is placed in the bath it needs no further attention until it is removed. This method of treatment also preserves the edges and details of the design and makes the surface uniform. If upon removal it is found that there are hard spots, not sufficiently affected by the acid bath, they can be treated separately after the article is finished with clean water. Care must be taken that the aggregate at the surface shall be of nearly uniform hardness or else pitting of the soft portions will result before the harder particles have been cleaned of the concrete coating. This action took place recently on a mixture of black marble with crushed granite. In the acid bath the black marble, a limestone, was almost completely dissolved, while the granite showed a fine texture and natural color. In this way a very fine piece of work was spoiled by the difference in the resisting qualities of the materials composing the surface aggregate.

The Pitting of Steel Water Pipes Due to Mill Scale*

It is usually considered by water works engineers that cast iron is preferable to steel for the smaller sizes of water mains, say up to 36 ins. diameter. Above that size steel is given the preference on the score of economy and facility in handling.

Although the use of steel for water mains is on the increase its more general adoption for that service is retarded by the fear of corrision and the resulting short life of the pipe. This corrosion usually takes the form of pitting. Pitting of this character does not attack wrought iron pipe; it rusts more uniformly than does steel pipe.

In making experiments to ascertain the causes of this corrosion, samples of steel and iron were placed in jars of water by the authors, and in jars containing various corrosive solutions. It was found, however, that the immersion tests in tap water and dilute solutions progressed too slowly, while the use of strong solutions failed to duplicate in the laboratory the conditions of actual practice.

Finding these tests unsatisfactory, a test in which corrosion was accelerated by a current of electricity was used. By this electrolytic test corrosion was made to take place in ordinary water and, although the ordinary conditions of service were not reproduced, it was unnecessary to use an acid solution. This test presented the manner of corrosion as distinguished from the rate of corrosion better than the acid tests inasmuch as the question under consideration was one of pitting and not one of general corrosion. The results clearly showed that mill scale has a marked influence on the uniformity of corrosion in the formation of pits.

With regard to this electrolytic test, it should be observed that when two plates of iron are immersed in water and connected with a battery in circuit, a current of electricity will pass through the water from one plate (the anode) to the other (the cathode), and iron will be dissolved from the anode. In other words corrosion will take place. If the plate forming the anode is uniform in composition, the corrosion will be uniform over its surface. If the anode is not uniform in composition, the corrosion will be greater at some points than at others, since the density of the current will not be uniform over the plate.

The mill scale on the surface of steel differs in chemical composition from the metal beneath it, also its thickness varies, and it exists commonly as a series of flakes; hence it was expected that the current density would vary and that the corrosion of the metal would occur in spots. Plates of steel ingot iron and wrought iron were thus tested, with the result that the wrought iron rusted in streaks, which covered nearly the entire surface, while the steel and ingot iron rusted in spots, the pitting in the steel being the more pronounced.

A second series of tests were made, but the mill scale was removed in each case by grinding on an emery wheel; these plates corroded uniformly without any sign of pitting. Further experiments were made with reference to the fact that mill scale may exhibit marked differences of potential toward iron due to its varying composition and thickness. According to the electrolytic theory of corrosion a solution of iron is brought about by the action of current set as between different particles of the metal which have different electrical potentials. Uniformity of composition of the metal tends therefore to diminish corrosion; it is believed that pits in steel occur at points where the particles have greater differences of potential than that of the metallic iron and the mill scale. It is thought that these may result from segregation of the impurities during the cooling of the ingot, or may be due to the effect of rolling, cooling or other treatment.

An Interesting Observation

In order to study the potential differences between the mill scale and the raw metal beneath, the method was adopted of connecting the raw metal of a sample with its mill scale by means of wires and placing a very sensitive galvanometer on the circuit. It will be understood that one wire was connected to the metal and one wire to the mill scale. It is interesting to note that when both poles were connected with the raw metal no current could be detected, but when one pole touched the raw metal and the other pole touched the scale a noticeable current was set up. On the steel plates the current sometimes differed greatly at points only 1 mm. apart, and it was found that the current varied with the thickness of the scale generally, but not always. In order to compare the different samples, areas of 1 sq. cm. were marked out in squares, and nine spots were tested in each square. The results were tabulated and show a surprising difference in the intensity of the current at various points. Microscopical examination of the scales showed in many instances the presence of minute cracks, through which water might enter and come in contact with the metal.

Experiments made with copper steels showed that, while the presence of small amounts of copper in steel against corrosion in weak acid solutions or in ordinary water. The presence of copper does not materially alter the electrical conditions of the scale, and does not therefore protect the metal against pitting. American ingot iron plates, so far as failure by pitting is concerned, proved to be somewhat better than steel, but the difference was insufficient to justify any great difference in cost. Wrought iron is much less likely to pit, and only under conditions of severe chemical corrosion sufficient to remove the mill scale and silicates, or under conditions of atmospheric corrosion where the electrolytic form of corrosion does not predominate, would the two metals be equal.

The effect of removing the mill scale is marked. A partial removal tends to increase corrosion, and thus where scale becomes chipped off in handling and in fabrication there is greater opportunity for electrolytic action between the scale and the raw metal. The complete removal of the mill scale appears to prevent pitting absolutely, and in the tests made after the removal of the scale there was not a single instance of pitting. The authors suggested that some method might be found to modify the mill scale during manufacture so as to make it more uniform, to improve its electrical condition, or to make it more easily removable.

Principles of the Imhoff Tank

The Essential Features in the Action of Sewage Disposal*

ENGINEERING attention is claimed by the Imhoff tank on two points; namely, this construction will, so it is said, remove from the sewage passing through it at least as much, if not more, of the solid matters contained as any other analogous method, and it will so affect the sedimented solids that they will not smell on standing and will dry out easily, decreasing their volume at least one-half.

There are two fundamental principles underlying the design and construction of this tank. First the volume of sewage in which settling is going on is not subjected to any disturbance by rising gas bubbles, and, second, the sludge is allowed to undergo digestion in a deep tank for many weeks.

It now seems a little thing to argue that better sedimentation would be obtained if the bubbles could be eliminated and yet a trapped tank bottom for sewage sludge is apparently a real invention of Dr. Imhoff. The trap is made very simply by making the bottom hopper-shaped (which also facilitates the downward motion of the sludge) and by carrying one side past the other so that gases rising from underneath are deflected up along the outside.

The Imhoff tank is said to throw down 95 per cent. of the "capable-of-settling" solids, and the advocates of the Imhoff tank explain that the term "capable-of-settling" refers to that proportion of suspended matters in the sewage which will settle out in a measuring glass when allowed to stand quiescent for two hours. If, as has been estimated, the amount of colloidal matter in sewage not capable of settling is 30 per cent., then the remainder, 70 per cent., is that which remains as precipitable after the use of chemicals; and if the Imhoff tank will throw down 95 per cent. of this, it means that, of the total suspended solids, it will remove 67.5 per cent. This should be compared with the 50 or 55 per cent. which is obtained from strictly domestic sewage and it is probably correct to say that the increased efficiency of the Imhoff tank due to the separation of the rising gas increases the deposit of solids from 10 to 15 per cent.

The second and more important principle of the tank, however, and that on which the growing popularity depends, is its remarkable performance in taking care of the sludge after it has been thrown down from the sewage. Three reasons are assigned for this.

In the first place, below the settling tank proper there is provided a large compartment in which the sludge is allowed to remain for a long period of time, from three to six months, during which time decomposition proceeds and effectively destroys the organic matter, so that when finally the sludge is removed it is odorless and much reduced in quantity.

Perhaps no single element has worked more against a greater use of the septic tank than the fact that offensive gases are given off during the septic process. It is to the elimination of these odors that the energies of the inventor of the Imhoff tank were directed, and for this purpose he provides a separate tank for disintegration of solids, but he carries on that disintegration without producing odors. His second point, therefore, was that there must be through the sludge compartment no moving or renewed fresh sewage. The construction of the tank seems to solve this problem and the reason has been given as follows.

In septic tanks the liquid sewage and the deposited sludge undergo decomposition together, while in the Imhoff tank all supernatant liquid passes through the tank so rapidly that no septic action is obtained, although in the sludge underneath a very high degree of septicization may be going on. It is said, therefore, that the organic matter in solution, either true or colloidal, is that part of any decomposition that is responsible for offensive gases and that the deposited solids not subjected to renewed application of fresh sewage do not in their decomposition become offensive. This may explain why the Travis tank smells and the Imhoff tank does not. Other theories have been advanced and perhaps, for the present, one is as good as another, but the general testimony of engineers who have seen Imhoff tanks in operation is that there is at the tanks and in their vicinity no objectionable odors.

The third point which seems to be fundamental in the design is that the deposited solids shall be overlaid with 25 or 30 feet of liquid. Shallow tanks do not seem to be as effective as deep ones and the reason assigned for this is that the gases of decomposition which are produced in the lower strata must, on account of the high pressure, accumulate in greater volume and in their escape produce a greater separation of the sludge particles than in shallow tanks. It is to this action of the gases in the lower layers of the sludge deposits that Dr. Imhoff ascribes the desired porous condition of the sludge which gives it its rapid drying properties after being taken from the tank. The decomposition which goes on at the bottom of the Imhoff tank also gasifies and liquefies a large proportion of the solids originally deposited in the tank.

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* By Henry N. Ogden, in Engineering and Contracting.

Fresh sludge deposited in the lower compartment contains, on an average, 95 per cent. of water. After remaining several weeks or months in the septic chamber, it will contain only 75 per cent. of water and about one-third of the original organic matter will have been either gasified or liquefied. Through these two agencies, an original volume of 100 cubic yards of fresh sludge will be reduced, according to their experiments and figures, to a volume of 16 cubic yards—a shrinkage in volume of about 84 per cent. They assert that through septic action only an original 5 cubic yards of dry sludge matter will be reduced to 3.92 cubic yards, a reduction of 22 per cent. The largest part, therefore, of the reduced volume is gained by the loss in water, this being pressed out on account of the great depth of tank, or indirectly by the greater pressure of entrained gas.

The reduced volume of sludge coming from the tank is not the only advantage. The quality of this sludge is quite different from that of ordinary sludge found in septic or sedimentation tanks. Instead of being compact, non-porous and in texture much like asphalt or rubber, Imhoff sludge is porous and much like a sponge in texture. In the former case, drying proceeds with difficulty and only after prolonged exposure in thin layers to favoring atmospheric conditions. The Imhoff sludge, on the other hand, is so porous that the contained water disappears readily, drying out so that it can be spaded in about five days and is therefore still further reduced in volume so that its volume is about 40 per cent. less than when emptied from the tank. In the Essen Valley, this sludge, except for a slight tarry ordor, has always been found by American visitors to be free from objectionable odors —a most marked contrast to some of the septic tanks and drying beds which have been built in this country.

Wisner estimates the Imhoff tank to cost twice that of shallow tanks designed to provide for the same Imhoff tank is perhaps only one-fourth that of ordinary tanks in volume, but the storage compartment for sludge underneath is so great that the total volume of the tank is nearly that of an ordinary settling tank. Apparently the practice of Dr. Imhoff is to make the upper compartment large enough to hold about two hours' flow and to make the lower one twice this size. This makes the Imhoff tank large enough to hold about six hours' sewage flow, which is about the capacity of the more recently built septic tanks.

The cost of the Imhoff tanks is higher even with smaller capacity because of higher unit prices in both excavation and masonry linings. The question, therefore, resolves itself into this: Is the greater sedimentation, the freedom from odor at the plant and the vastly reduced labor of disposing of the sludge sufficient justification for an increased cost of construction of the tank and for the patent fee which the inventor very properly claims? It has been said that there is no opportunity for equalizing the variable flow in so small a tank and that for best results a large tank (sedimentation) ought to precede the Imhoff tank action. But with every criticism considered, and with full appreciation of the difficulties of the deep tank construction, the boon of an odorless sewage disposal plant is so great and the elimination of the sludge problem so gratefully appreciated, that its rapid installation in this country cannot but follow its European successes .

Highway Improvement in New Brunswick

Premier Flemming, of the province of New Brunswick, announced recently that the provincial government had determined to spend $100,000 each year for the repair of bad stretches of road throughout the province. In addition, Premier Flemming stated that it was the expectation of the provincial government that the Dominion government would appropriate $50,000, providing a highway bill now pending in the Dominion parliament became a law.

The Good Roads Association of New Brunswick recently presented a petition to the House of Assembly signed by five thousand people residing in various parts of the province asking for better roads.

R. C. School, Cote St. Paul, Que.

The accompanying illustration is the architects' perspective of the new Roman Catholic School at Cote St. Paul, Quebec, upon which work is now proceeding. Details of design and construction were given in our issue of March 5th but the illustration was not then available. The architects are Messrs. MacDuff & Lemieux, of Montreal, while the contractors for the masonry are Filon Bros., for the painting and carpentry, Jos. Marcotte, and for the iron and steel, the Dominion Bridge Company. The estimated cost of the building is $150,000.

Proposed R. C. School, Cote St. Paul.

Unusual concreting methods were employed in the construction of the retaining walls and foundations for the new open hearth steel plant of the Brier Hill Steel Company, at Youngstown, Ohio. The distribution tower employed was of the ordinary type with elevator skip from mixer to chutes, except that this tower, mixer and electric driving machinery were all mounted on a large flat car. This car travelled on a track so laid as to keep the tower in the center of the working zone, thereby enabling the pouring to continue without interruption. Material cars were run in trains of six cars on industrial tracks laid parallel to the tower track. These cars were filled by a patented unloader direct from the cars of cement and aggregates and were then hauled to the tower by a cable and emptied into the charging skip of the mixer. The aggregate used was granulated blast furnace slag. The work was started in the middle of June, 1911, and up to November 15, 1911, 40,000 cubic yards of concrete had been placed in this way, or about 45 cubic yards per hour.

A deep bore hole has been put down near Czuchow, in Silesia. Its length, according to the "Mining World," is 7,347 feet and the time required for its

Electrically Operated Bridge Tramway for unloading Sand and Gravel

completion was 982 days. The first 174 feet were bored by augur, the next 1,715 feet by churn drill and the remainder by diamond drill. More than 700 carats of diamond were used up. The total cost of the bore is reported to have been $72,900. The hole was drilled to ascertain the position of coal veins. The original hole had to be reamed out to permit the final depth to be attained.

An arched roadway foundation was described in a paper by Mr. C. H. Young before the Iowa Engineering Society recently. Eight blocks of brick pavement were laid upon a foundation of mill refuse, sawdust and rattlings that had settled for 25 years. The 5-in. concrete slabs on each side of the car tracks were planned as two arches, the concrete base under the tracks and at the curb being made heavy enough to take the thrust. In this way it was not necessary to rely on the unstable material for a foundation.

Modern Method of Unloading Sand and Gravel

THE illustrations reproduced on this page show the new electrically-operated bridge tramway designed by the Dodge Department of the Link-Belt Company, of Philadelphia and Chicago, for the Vigo Washed Sand & Gravel Company, Terra Haute, Ind., for unloading sand and gravel from barges and delivering the material to a storage bin. This is one of the most efficient machines ever devised for this kind of work. The length of the bridge is 365 feet, the capacity of the grab bucket, 1½ yards, the hoisting speed of bucket, 125 feet a minute and the trolley speed of bucket, 1,000 feet a minute.

Efficient Method of Unloading Material

The Architect's Shortcomings

THE career of both architect and contractor is fraught with mistake, but there are a few outstanding architectural shortcomings with which many readers of this journal are concerned very particularly, and so doubtless the following observations in this connection, made by Chas. E. White, C.E., in Building Progress, will be received with interest.

Contractors are frequently up against it for lack of blueprints when they come to bid on a new building. Architects, usually in a great hurry to get bids, sometimes have but half a dozen sets of blueprints, which they distribute to as many general contractors, forgetting that each general contractor may be obliged to take half a dozen sub-bids. Often this makes it impossible for general contractors to take competitive sub-bids, with the result that each bid is higher than it would be if the architect furnishd them with more blueprints. Sub-bids frequently vary as much as ten per cent. on the same job. Careful competition among sub-bidders is bound to secure lower prices, greatly to the owner's advantage if his architect would be just a little more liberal in providing sufficient blueprints.

Defective Blueprints

Another criticism sometimes made of the architect by contractors is that the quality of blueprints is often very poor. Any superintendent who has been on a job and tried to read figures and dimension lines on a blueprint which has bleached out almost white will agree with me in the poor quality of blueprints frequently furnished.

Sometimes serious mistakes on the job are made by incorrect reading of illegible figures. Remember, the mason must get his lines accurately, often working to fractions of an inch, so it is up to architects to give him legible plans to work from.

Linen blueprints would be ideal, but they are almost prohibitive in cost. A very satisfactory substitute lies in using heavy paper, carefully printed with clean white lines on a strong blue ground—just such prints as anybody can make with first-class materials when proper time is taken for printing and washing.

An excellent way to preserve blueprints and prevent them from becoming torn on the job is to mount the set used there on heavy cardboard, each sheet separately.

Variation in Details

Examine two sets of plans turned out by any two architects and you will find great variation in the way details are drawn. In the office of a certain architect who does residence work exclusively an interesting fact recently developed. About a year ago plans for a residence were made and bids taken. As frequently happens, the bids were so high that the owner decided to wait over a season, thinking he might get lower bids. When the next year came around orders were given to take new bids and the architect got out his drawings to look them over before having new blueprints made. He noticed that few details were included in the drawings—so few, in fact, that he wondered how such a set plans ever got out of his office until he remembered how hurriedly they had been made. A set of inch-scale details was immediately drawn up and included in the plans—simple drawings showing designs of millwork and special features in the construction.

When bids came in once more the architect was astonished to find prices lower than they had been the first time, notwithstanding the brisk advance in cost of building materials. Upon investigation he found that the lower bids were the result of the new details. Contractors who figured the first time, not understanding just how the house was to be built (owing to incomplete drawings) had been afraid to figure close, but as soon as they saw the illuminating new details, they could figure more accurately.

Importance of Details

Details are important items in plans, and architects who neglect to prepare details until contracts are let frequently unintentionally make work cost more than it should. Even a few quarter-inch scale details showing special features of construction are very useful to the contractor in figuring. Details of cabinets, cupboards, inside and outside trim should always be included, and this method may be depended upon to procure for the owner a closer figure than when details are omitted and contractors have to "guess at" what the architect wants. When they do "guess," you may depend upon it contractors "guess" high enough to escape any possible loss to themselves.

Defective Specifications

The same criticism made about plans may be made about specifications. Ambiguous statements—vague clauses not clear in meaning or which seem to contradict the plans, usually alarm contractors who do not know precisely what the architect is driving at. Then the contractor tacks on a few dollars more as a "factor of safety," and the owner pays more for his building than he ought to.

Vague specifications difficult of interpretation are not conducive to good workmanship from the contractor's employees. The workman on the job is too busy to ponder very long over incomplete specifications—nor is he a mind-reader who can understand what was in the architect's mind when the specifications were written.

If architects really wish to help their friends the contractors, they should also correct an abuse that often causes contractors much concern—and that is procrastination in preparing full-size details. Every contractor knows how busy most architects are, and they appreciate how hard it is to get full-sized details out promptly; nevertheless, so many jobs are seriously delayed by this cause (and so frequently the delay is blamed entirely to the contractor) it is only fair to say that this delinquency should be corrected by every architect ambitious to be perfectly "square."

Just as soon as the contract for a building is let architects ought to follow up with a complete set of full-size details. Prompt service in this regard will do much to prevent delay.

Promptness in Issuing Certificates

Another thing that makes the biggest kind of hit with contractors is promptness in issuing certificates as soon as they are due. Nothing pleases any of us more than to receive money immediately it is due, yet it is surprising how dilatory some architects are in giving certificates, frequently causing contractors to wait for their money day after day.

Some architects make it a special practice to issue certificates immediately they are due, whether contractors ask for them or not. All contractors like to do business with such. Indeed, I have no doubt their work is let at lower prices than the work of other less accommodating architects—and, no doubt, they have less trouble on the job.

The every-day relations between architects and contractors are made much pleasanter when both sides are careful to do their work promptly and efficiently.

Water-Waste Reduction by Meters

EVIDENCE showing the extent to which the installation of meters has reduced the water consumption in Kalamazoo, Mich., was presented recently before the Michigan Engineering Society in a paper by Mr. George Houston, water commissioner. During the year ending March 31st, 1893, he said, with a population of less than 18,000, no meters and 30 miles of mains, the total pumpage was 787,621,902 gal., for which the department received $15,000. In 1912, with all services metered, a population of 45,000 and 78 miles of mains the pumpage was 696,898,797 gal. and the revenue $42,773. The net minimum charge in 1912 was $3 per year. A comparison of these figures shows that the pumpage in 1912, with meters, was 90,772,923 gal. less than in 1893, without meters and that the increase in revenue amounted to $27,773.

Meters on Fire Lines

Mr. Houston discussed also the metering of fire services, including sprinkler systems. From the figures it appears that the city, under the old conditions of no meters, was supplying many thousands of gallons of water for which no returns were received. Mr. Houston cited a number of cases to support his belief.

In the first case all lines through which water for general purposes was used were metered and their average consumption per month for twenty-one months prior to the installation of the fire line meter was 6,066 cu. ft., while with the same use of water after the installation of the fire line meter the consumption has averaged 42,305 cu. ft. per month.

In a second case for twenty-seven months prior to the installation of the fire line meter the average consumption per month was 5,200 cu. ft. Since the installation of the fire line meter, and the disconnection of a 2½ in. line through which a considerable quantity of water was used the consumption has averaged 10,000 cu. ft. per month.

Prior to the installation of the fire line meter in a third case the consumption averaged 4,443 cu. ft. per month. Since the installation of the fire line meter, and after making every reasonable effort to conserve the water supply, which the property owners admit that they did not attempt to do before their fire line was metered, the average monthly consumption has been 30,379 cu. ft.

Comparison of Water Consumption

In a fourth case a certain industry supposedly was not using water for its plant except for sprinkling purposes. After the installation of the fire line meter, and after cutting off three of 6 in. lines the consumption was about 20,000 cu. ft. of water in about one month. After this was discovered, the owners closed the gate entirely so that the line supplying the sprinkler system with city water was shut off. In the meantime they provided a secondary supply by means of an elevated tank. This condition prevailed for a few months, at the end of which time they concluded that they would have to have city water for drinking purposes in and about the mill. A 2 in. connection was then made with the sprinkler line between the check-valve and the meter, the line was carried into the building and the water turned on from the city main. Since that time the mill has used an average of 58,440 cu. ft. per month, and during last month it used 95,100 cu. ft. The question arises, "What were they doing for drinking water during all the years prior to the installation of the fire line meter?"

A fifth case cited by Mr. Houston was one in which the water consumption for 18 months prior to the installation of a fire-line meter averaged 15,511 cu. ft. per month. Subsequently the consumption increased to 34,444 cu. ft., although the number of employees had been reduced considerably.

Since meters were installed on fire lines in Kalamazoo every one of the firms above referred to, Mr. Houston states, has been attempting to check any unnecessary use of water. Still the consumption has increased, which proves conclusively, he says, that this same waste, or uses other than were known, was going on before the meters were put in, and, no doubt, to a far greater extent than the above figures show.

Derricks for the Erection of Steel Work

IN an address on derricks recently presented by Mr. Frederick Tench, of New York, before a convention of the employees of Mussens, Limited, Montreal, the design and use of derricks for construction work were discussed. Safety was made more important than any other consideration, and it was pointed out that there are generally more derrick accidents than any other kind on important construction work. These are due to the use of imperfect derricks and to the improper use of good derricks. With properly designed and proportioned derricks accidents may happen on account of inadequate guying, insufficient anchorage of the stifflegs, sudden stress from a slipping connection with the load, and from neglect to lubricate the gudgeon pin.

The great differences in requirements and conditions of operation make corresponding differences in the types and details of derricks most suited for different sorts of work, and for most of them the all-steel derricks are said to be very suitable and are becoming more and more desirable as the cost of timber increases. These are especially adaptable for special service and for repeated handling, as was illustrated by a pair of guy derricks with 35-ft. masts and 80-ft. booms of 2,000 lb. capacity that were built in sections not more than 12 ft. long or 300 lb. in weight for transportation on mule back over the Andes Mountains to mining camps in Peru. Very light tripod derricks called "jinniwinks" are much used for the lighter members of steel buildings and for handling timber and are operated by hand or with power.

Very different from them were two 75-ton steel derricks mounted on trucks on the ground and afterward lifted high up on the framework of the New York Central & Hudson River Railroad terminal station in New York, where they erected a large part of the 30,000 tons of heavy structural steel members. Experience shows that, although stiffleg derricks are sometimes most desirable for the erection of steel buildings, it is generally more economical to use guy derricks with masts from 8 to 10 ft. longer than the booms.

More and more extensive use is now being made of derricks having foot blocks with three sheaves to carry lines from the hoisting engine to clamshell and orange-peel buckets suspended from the boom for excavating purposes.

Mr. Tench called particular attention to the special derrick fittings which his firm designs and manufactures. These include riveted head blocks fitting over the tops of timber masts and secured by bolts, without cutting or boring the mast to weaken it and cause decay from the collection of water there. The foot blocks have spherical contact [illegible] both tension and compression stresses from the derrick to its foundation.

Gudgeon pins and goosenecks should be of heavy construction, and the sheaves should have large axles to reduce the pressure, so that wear on the moving portions is largely diminished and none of them, except the sheaves, is likely to need replacement. The sheave bearings should be lubricated through centerbored pins or by self-lubricating bushings.

The design of heavy derricks for special service was illustrated by a description and photographs of a steel guy derrick with a capacity of 86 tons and 65-ft. radius which has just been built to export to Manila for the United States Government.

Provincial Convention at Edmonton

THE third annual convention of the Alberta Association of Builders' Exchanges was held in the Assembly Room of the Edmonton Builders' Exchange. The delegates were welcomed by Mr. T. H. Miller, vice-president, in the temporary absence of the president, Mr. J. H. Millar. Response was made by Mr. Geo. Sylvester, Calgary.

In his presidential address, Mr. J. A. Trimble, vice-president of the Medicine Hat Builders' Exchange, dealt at some length with the various amendments to the Mechanics' Lien Act and the Workmen's Compensation Act. The resolutions carried at the meeting included the following:—

That all Builders' Exchanges through their respective Boards of Trade should use their influence to have their banks built entirely by local contractors and use local material and be under local supervision, and that a copy of this Resolution be sent to all Boards of Trade in the Province.

That your Resolution Committee hereby put themselves on record as being opposed to members breaking faith with each other in the matter of wages paid and that we bind ourselves morally one with another as members, both individually and collectively, of the various Exchanges, not to pay more than 70 cents an hour to bricklayers, this to take effect May 1st, 1913, and in respect of wages paid in all other trades the schedule decided on at the 1912 Convention be adhered to.

That the principle of open shop be adhered to, except in the case or cases of emergency, but the Exchanges are in no case to enter into agreement with Labour Unions which contain a closed shop clause and that the Provincial Exchange be notified of any action taken by individual Exchanges in regard to this.

That the principle of open shop be adhered to and that in no case are individual members to enter into agreements with labour organizations.

That this present Convention strongly advocate the appointment of a good live Organizer to organize the different Exchanges of the Province as this seems to be badly needed, also that the Secretary correspond with the Exchanges of Saskatchewan and Manitoba with a view to devising some means of bringing in the Province of British Columbia into the Western Section of the Canadian National Association of Builders' Exchanges.

That this Alberta Association of Builders' Exchanges together with the various local Exchanges place themselves on record as heartily in favor of technical and industrial education, that the members individually and collectively signify their willingness to do anything in their power to promote same, and further that a copy of this resolution be forwarded to the respective school boards in the province.

That this Committee go on record as being strongly in favor of the different Exchanges throughout the province making some concerted effort to acquire for their mutual benefit a building purchased, or otherwise, in which could be displayed exhibits of the different supply houses and in which many of the builders and sub-contractors could obtain offices, thereby the closer cementing for their mutual benefit the different trades and supply people.

That this Convention recommend to the members of the Provincial Exchanges the carrying of their own Workmen's Liability Insurance, after the model adopted by the Winnipeg Builders' Exchange.

A special committee selected to report on the proposed appointment of an organizer recommended that the remuneration of such official be placed at $250 a month.

At the election of officers, held at the close of the session, Mr. J. A. Trimble, of Medicine Hat, was elected president, and Mr. Thos. H. Miller, of Edmonton, vice-president. Mr. Peter Rule was elected provincial director from the Edmonton Builders' Exchange. Mr. G. Sylvester from the Calgary Builders' Exchange, Mr. G. S. Worthy from the Medicine Hat Builders' Exchange, and Mr. C. D. Leader from the Lethbridge Builders' Exchange.

Proposed amendments to the organization of the Compensation Act relieved the employer of all liability if misconduct could be proven on the part of the employee and made it compulsory for arbitration proceedings to be commenced within nine months from the occurrence of the accident causing the injury, or in case of death, within nine months from the time of death. As the Act now reads, the employee may secure compensation at any indefinite period he may choose. Another amendment provided that in case of permanent disablement an employee should receive compensation to an amount equal to that which would have been paid had death resulted from the injury instead of according to present legislation of securing compensation from the time of the injury until his death, which may cover a period of thirty of forty years.

Proposed Road Work in Alberta

It is stated that 345 miles of new roads will be built in the Lethbridge road district of southern Alberta during the current year. Of this mileage 160 miles will be trunk lines and 185 will be laterals from the trunk lines.

To the west of the Lethbridge district the main trunk line, which is to form a part of the so-called National Highway, is to be completed in the McLeod district from Kipp to Crows Nest. On the east of the Lethbridge district the link between Bow Island and Seven Persons will be completed into the Medicine Hat road district. The road is already graded between Seven Persons and Medicine Hat.

If these plans are carried out there will be an improved road 800 miles long between Medicine Hat and Crows Nest. It is estimated that in the three southern Alberta districts through which the main east and west trunk lines will run, there will be constructed at least one thousand miles of new road during 1913.

Mr. A. G. Sangster, formerly electrical superintendent of Saskatoon, will open an office in that city as consulting engineer on electrical and hydraulic work. Mr. Sangster has recently been retained by the town of Rosthern in connection with work there.

Problems of Water Supply and Sewerage-3

Third of a Special Series of Articles—Problems of Delivery: Power Required, Static and Working Pressures, Reservoirs and Standpipes, Distributing System

By W. Muir Edwards, M.Sc., C.E., Professor of Civil and Municipal Engineering in the University of Alberta

HAVING selected a source from which a sufficient quantity of suitable water may be obtained, the next step is to arrange for its delivery to the consumer. In the space available it is not possible to deal in a consecutive manner with all the phases of this subject. Certain of the more important will have to be selected and dealt with as more or less separate units. Those of most general interest might be selected as (a) Power Required, (b) Static and Working Pressures, (c) Reservoirs and Standpipes, (d) Distributing System.

Power Required

To maintain a flow of the quantity required, under a given pressure, a succession of resistances must be overcome from the moment that the water enters at the inlet to that of its final delivery to the consumer. Each foot the water is lifted, each pound of pressure required, each bend or valve, and each length of pipe, adds its quota to the total resistance.

Since the vertical distance through which the water is raised is both the most obvious and the most convenient measure of the work to be done and hence the power required, all resistances are expressed in these units. Thus a pressure of 100 lbs. per sq. in. is equivalent to an additional head of 230.4 feet, the frictional resistance per 1000 feet of 12 in. pipe, in which the water is flowing at 5 feet per second, is equivalent to a lift of 8.5 feet, and the losses of energy due to friction at entrance, velocity of the water, obstructions due to bends and valves, may all likewise be expressed in this unit.

The head due to difference in elevation between the source and point of delivery may be a negative one, or in other words may supply rather than require energy. This difference may be sufficient to supply both the head required to overcome friction and that required for pressure and so afford an opportunity for a complete gravity supply. If the head is not sufficient the development would consist of a combined gravity and pumping system.

The power required to raise a given quantity of water per day through a given vertical height or to deliver it at a given pressure is entirely independent of the linear velocity of the water. For instance the h.p. required to deliver a given quantity of water through a 24 inch pipe with a linear velocity of 3 feet per second or through a 6 inch pipe with a velocity of 48 feet per second will be exactly the same as far as these elements are concerned. But the h.p. required to overcome frictional resistance in the second case will be 1024 times as great as that required to overcome the resistance in the larger pipe with the slower flow.

This frictional resistance is proportional to the length of the pipe, to the square of the velocity of the water and to the reciprocal of the diameter. As the areas must vary as the square of the diameters and the velocities as the reciprocals of the areas, therefore the frictional resistance for equal lengths of pipes will vary as the reciprocals of the fifth power of the diameters. Thus the substitution of a 12 inch for a 10 inch pipe would lessen the frictional loss about 2½ times. Incidentally it might be mentioned that this substitution would increase the cost of the pipe line about 1 1-3 times. Difference in elevation or its equivalent pressure is easily appreciated; but the head required to overcome frictional resistance is not as apparent and its application might be emphasized by two or three concrete examples.

To deliver a fire stream of 200 gallons per minute through an ordinary fire hose and 1⅛ in. nozzle requires a nozzle pressure of 40 lbs. per sq. in. and an additional pressure to overcome friction of 37 feet or 16 lbs. per sq. in. for each 100 feet of hose. With a hydrant pressure of 100 pounds per sq. in. it would thus be possible to lay only 375 feet of hose and maintain such a stream. This stream would carry to a vertical height of 75 feet, a height of 60 ft. at a horizontal distance of 50 ft. and to a height of 45 feet at a horizontal distance of 75 feet. High hydrant pressures or close hydrant spacing are thus essential if good fire streams are to be obtained.

Again, suppose a two-way hydrant is to be placed on a pipe line; the frictional loss in 3, 4 and 5 inch pipe, delivering 400 gallons per minute, is 32, 6.9 and 2.5 pounds per sq. in. for each 100 feet of pipe. Hence the rule that "no hydrant shall be placed on anything less than a 5 inch pipe.

Rolling the clay puddle forming the face of a reservoir.

A 10 inch pipe in which the water is flowing at 5 feet per second would deliver about 1,000 gallons per minute (equivalent to the average supply required for a municipality of 17,000 population). Each mile of such a pipe would offer a frictional resistance equivalent to a direct lift of 57.2 feet, and require for this purpose 17.3 h.p. To deliver the water under a pressure of 50 lbs. per sq. in. would be equivalent to raising it through 115 feet and would therefore require about 35 h.p. By substituting a 12 inch for the 10 inch pipe the power required to overcome frictional resistance is reduced to 7 h.p. per mile of pipe, but that required to produce pressure remains 35 h.p. as before. The selection of the proper size of pipe in a pumping proposition is merely an economic balancing of reduced cost of power against increased cost of construction.

In a long pipe line or in a poorly-designed distubuting system in which the pipes are not properly cross-connected, nor of sufficient size, the frictional head and the consequent power required may be large but in general in a supply in

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[*] The 1st and 2nd article of this series were published in our issues of February 12 and March [illegible] respectively.

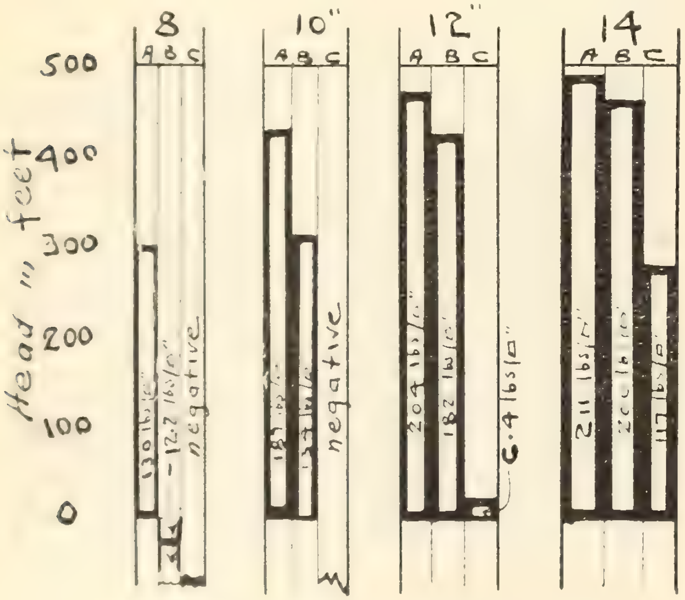
where pumps are used the pressure and the lift are the factors which contribute most to the consumption of power.

Static and Working Pressures

In a gravity supply great emphasis is some times laid on the static pressure. The local amateur water experts quote the old saying that "water will find its own level" and expectations are raised which cannot be realised under working conditions. In all such supplies, in most cases of which the source is at some distance from the point of consumption, allowance should be made for the frictional resistance which will be set up as soon as the water begins to flow. The static pressure is only of interest in that, if excessive, it may cause damage to the pipe line or distributing system but must not be relied upon to supply water for fire fighting purposes at elevations approaching that of the source.

In such a gravity supply there might be met one of three conditions: (1) a constant flow from the distant source to an adjacent distributing reservoir which would take up the fluctuations in supply and deliver both the ordinary and fire supply under the required pressure; (2) a flow which would deliver the ordinary supply under the necessary pressure and would deliver the fire supply under a small pressure to fire engines; (3) a direct supply for both ordinary and fire purposes under suitable heads.

The following sketch illustrates graphically the difference between static and what we might term working pressures. Assume a source, 4 miles away and 500 feet above the point of delivery, which is required to supply a population of 10,000. The pressures during average, maximum daily, and maximum daily plus fire rate, are shown for supply pipes of 8, 10, 12 and 14 inches diameter. The column marked (a) shows the pressure in each case when a supply at the average rate of 75 gallons per capita per day is being drawn. That marked (b) shows the pressure during a draft at a rate 175 per cent. of the average and that marked (c) shows the pressure resulting if in addition to a rate 150 per cent. of the avarage there be required $2.8\sqrt{10}$ fire streams of 200 gallons per minute each.



Graphic illustration of difference between static and working pressures.

From the diagram it will be seen that an 8 in. pipe would deliver the average supply to an equalizing reservoir at an elevation 300 ft. above the point of delivery or put in another way would deliver the average supply at 130 lbs. per sq. in., but would require a suction of 12.2 lbs. per sq. in. to deliver at the maximum daily rate and would not deliver the fire supply at all. A 10 in. pipe would supply the maximum daily draft at a pressure of 134 lbs. per sq. in., but could not deliver the quantity required for fire purposes. A 12 inch pipe could deliver all variations of the ordinary supply at a high pressure, but could only deliver the required fire supply at a pressure of 6.4 lbs per sq. in. (this size would be satisfactory if fire engines were relied upon to increase the pressure at times of fire). A 14 inch pipe would give a complete gravity supply with ample pressure at all times. It will thus be seen that the draft on the source and the size of supply pipe are very important factors in determining how much of the static head is really available as pressure during working conditions.

Distributing and Equalizing Reservoirs

The function of an equalizing reservoir is to provide for the daily variations in flow. It has been pointed out that, although the average rate at which water is required by a community might be say 75 gallons per capita per day, at certain times of the day this rate would be increased to 110 gallons and during the night might fall to 30 gallons. A long pipe line that is designed to deliver at the 110 gallons rate would be too large for the lower rates and pumps designed for the peak load would be inefficient when running at the lower rates. If, however, there be an equalizing reservoir into which the pipe line or the pumps can deliver constantly at the average rate, then we obtain a maximum efficiency from each. As will be seen the capacity of a reservoir solely for this purpose is the excess of the maximum rate over the daily average for a few hours of the day. In the case cited the capacity would be that required to supply 20 gallons per capita per day for an average of six hours per day. For a population of 50,000 this would be 250,000 gallons.

It is very important that a public supply should not be interrupted. But breakages are bound to occur, alterations must be made, and thus a reserve which can be drawn upon in case of need is part of every good design. A distributing reservoir is the best means of attaining that independence among the several portions of the distributing system that is necessary to guarantee a continuous service. Such a reservoir would have to contain several days supply to enable the shutting off of the delivery pipe or of the pumps if necessary. A reservoir of this capacity is often a physical impossibility and more often is not financially advisable. In these cases the same result is obtained by duplicating the pumping machinery or the delivery pipe.

In cases where a reservoir adjacent to the distributing system is not feasible it is advisable to arrange for a standpipe or elevated tank which will steady the pressure on the pumping plant and which, especially where increased pumping is relied upon for fire protection, will hold at least one

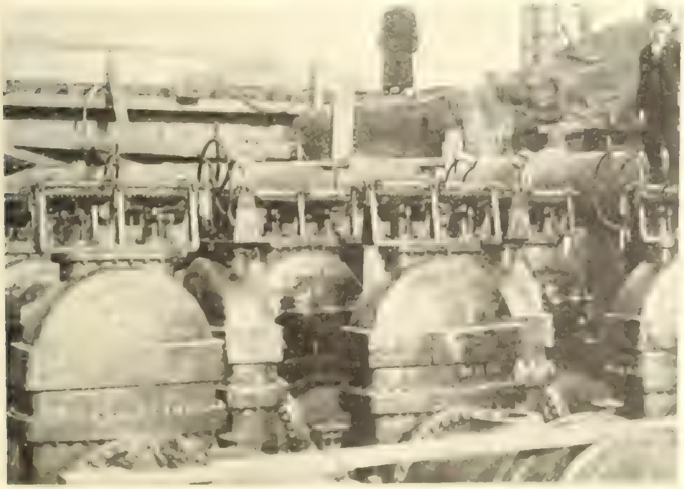
The final waterproofing of a reservoir embankment. Facing the puddle with asphalt.

The complete reservoir showing the delivery tees in the far corner and the floating draw-off valve in the foreground.

hour's fire supply. If a reservoir or tank is to be relied upon for fire protection it should have a capacity equal to six hours' fire consumption. All reservoirs occuring between the source and the point of supply perform, more or less both an equalizing and a distributing function. They should be introduced wherever they are economically possible. Their use will reduce the size of pipe lines, lessen the duty of pumps, increase the possible draft from groundwater supplies and safeguard the supply from costly interruptions.

Distributing System

The distributing system is composed of a network of mains, sub-mains, laterals and house connections. The mains and sub-mains should be laid out to deliver water to the points of maximum consumption with as little frictional loss as possible. The laterals are laid in each street, not already served, in which house connections must be supplied. In the majority of cases the mains and laterals are of cast-iron pipe which will consist usually of a 6 in. and 8 in. grillage with sub-mains 10, 12, and 14 inches in diameter, and large mains of 24, 30 or even 60 inch pipe; 3 and 4 inch pipe would be quite satisfactory for most laterals were it not for the requirements of fire supply. House connections are usually of lead pipe ¾ to 1½ inches in diameter, and have a stop-cock at the property line by which the corporation may control the supply to each consumer.



Large mains. Valve chamber No. 2 on the three 60-inch distributing mains carrying the filtered water from one of the large filtration plants in Philadelphia. The complete system of cross-connections by which any combination of the pipes may be made, can be clearly seen

The pipes must be laid at a depth which will protect them from the frost (6 to 8 feet is usually sufficient for this purpose), but may otherwise follow the general contour of the ground. They should be laid in single trench. The practice of laying them on a shelf in excavations for sewers or other conduits is conducive to future trouble in maintenance and although possibly cheaper in first cost should not be countenanced by any municipality.

The system should be planned on the gridiron principle, cross-connection being put in frequently. This enables the water to flow along many paths to supply heavy local consumption and thus reduces the drop in pressure between the power station and the point on the system where such heavy draft occurs. The need of maintaining the hydrant pressure during a fire has been already emphasized and it is to this cause mainly that heavy local drafts are to be attributed. These cross-connections also eliminate the dead-ends and maintain a circulation in the system. Wherever possible, all laterals should be connected at both ends to the pipes in streets running at right angles to them.

Valves should be placed every two blocks or so on mains or submains and at each connection of a lateral to the submain. Such an arrangement may seem an extravagance at the time of installation, but anyone who has had to do with either the routine work of maintenance or with special investigation as to district consumption, loss, waste, etc., will appreciate the necessity of such valve control.

The final waterproofing of a reservoir bottom. Surfacing with asphalt.

In installing a system or in adding to one already in operation careful reference measurements should be taken by which valves may be located quickly if covered up by snow, ice or drift. In fact a record of sizes and locations of pipes, position and [illegible] of valves, hydrants, [illegible] connections, etc., should be kept from the installation of the system and tabulated in a manner that can be easily understood by one not intimately connected with the details of the work. In many cases such information is contained only in the memories of the employees of the water department.

There is much to be said in measuring not only the total supply at intake but also each delivery to a consumer. Many cities whose supplies have not been metered would certainly introduce them were it not for the large initial expense and the strong public feeling against such a step. It should always be remembered that the meter does not discourage the legitimate use of water but is a most valuable aid in preventing useless waste on the part of the consumer and [illegible] any leaks on the distributing system outside the property line. If installed at the time the supply is inaugurated they are [illegible] as a matter of course by the public. It would seem advisable to meter all supplies both public and private and credit the water department with the use of water by other departments of the Corporation. Often such departments are the worst offenders in the wasteful use of water.

A thorough metering of the supply delivered, together with a recording meter at the inlet is of great assistance in calculations as to future development, in investigations of the efficiency of the power house and distributing system and generally in checking the business efficiency of the department.

The delivery of the water is the point of contact between the department and the public. The consumer must be kept satisfied if the system is to be considered ultimately a success. Careful design is essential to guarantee quantity, pressure and permanence of supply and a well organized department is necessary to the maintenance and successful operation of the completed plant.

Trusses Without Diagonals in Reinforced Concrete

By V. J. Elmont, A.M. Can. Soc. C.E.*

A theoretical and economical study of trusses without diagonals was first given by Prof. Vierendeel in his book—"Longerons en Treillis et Longerons a Arcades" (1897). As results of his researches for steel trusses he says that his type possess the following advantages:

1st. Theoretical—The calculations can be made without recourse to any assumptions either as to the connections of members or as to whether the angles at the panel points remain constant under loads.

2nd. Technical—These trusses are stiffer, less susceptible to vibration, less liable to corrosion and less subject to secondary stresses due to eccentric framing than the ordinary truss. These advantages tend to increase the life of the truss.

3rd, Commercial—Subject to the same conditions, these trusses cost less than the ordinary truss, the saving sometimes being as high as 25 per cent.

Since 1897 a number of steel bridges have been designed and constructed after the Vierendeel system. A special interest in these bridges was shown as Prof. Vierendeel proved the correctness of stresses and dimensions figured out after his formulae by test loading to the breaking point of an entire bridge of 100 ft. span. Amongst the steel bridges actually built without diagonals may be mentioned: (1) bridge over Gare du Nord at Brussels, 164 ft. span; (2) highway bridge over the Schelde at Avelghem, 138 ft. span; (3) highway and railway bridge at Beeringen, 85 ft. span; (4) highway bridge over the Lys in Ousselghem, 146 ft. span; (5) highway and railway bridge at Charleroi, 98 ft. span.

Owing to the difficulties and expenses which arise from construction of the rigid connections between verticals and chords, on the ability of which to resist bending moments, the stability depends, the Vierendeel trusses do not seem likely to play any important role in the building of steel bridges unless perhaps cast steel may be used to some degree for the panel points.

For reinforced concrete bridges (highway and railway) and buildings the Vierendeel trusses have already been used in a very great many cases both in the United States and Europe. As reinforced concrete structures are built as a monolith, this material naturally meets the essential requirement the Vierendeel trusses call for, namely rigidity at the panel points. The direct saving in material in a Vierendeel truss as compared with a solid girder is generally of little importance due to the more complicated forming and reinforcing, but indirectly the Vierendeel trusses mean a considerable progress in reinforced concrete engineering, because they decrease the dead load, which forms such a material part of the total loading, thus enabling the engineer to bridge larger spans than is otherwise possible, in an economical way, at the same time the structure presents a more pleasing and satisfying appearance.

Trusses with diagonals and verticals have also been used in reinforced concrete buildings and bridges, but for the most part some years ago, before the Vierendeel trusses had been testloaded over and over again in laboratories and actual buildings. The Vierendeel trusses are now the most frequently used owing to their economical and practical advantages over the trusses in common use; these latter cause considerable secondary stresses in steel and concrete due to the inflexibility at the panel points, give high tension in the web members and therefore afford more difficulty in getting them connected with the chords. In consequence of the number and inclination of the web members they need a more expensive forming.

The statical computation of a Vierendeel truss will at first sight seem to be too complicated to be serviceable for practical purposes, as it has three times as many statically undeterminable quantities as it has panels, even when simply supported. The exact figuring can, as Prof. Ostenfeld has shown, be carried through comparatively easily by considering each panel as a frame and choosing a special point in which we let the three unknown quantities act; the equations of elasticity can then be solved graphically, similarly to those for continuous beams and trusses.

For reinforced concrete structures both in bridges and buildings it is near enough to simplify the figuring by assuming a hinge in each vertical, midway between upper and lower chord. For trusses subject to small bending moments a step further can be made with satisfactory correctness in the direction of reducing the problem by the assumption of a hinge in each of the truss members, both in chords and posts (except one). The truss thus made statically determinated, the stresses can be computed directly without use of the equations of elasticity or knowledge of the dimensions of steel and concrete beforehand.

As the stiffness of the panelpoints is of such vital importance for the stability of Vierendeel trusses special stress must be laid on the providing of necessary reinforcement in those built in concrete for resisting the bending moments originating in the fixing of the truss members in each other. Thus bars have to be placed both in the top and bottom sides of the upper and lower chords to take up the tensile stresses called forth by the bending moments and also in both sides of the verticals.

The reinforcing in the verticals can either be carried straight out into the chords and be anchored there; or, better still, bent alongside the verticals as they are mostly splayed out to better connect them with the chords and at the same time to increase their concrete area where the bending moment is greatest; the steel is then placed nearer the tension side and the anchor length in the chords is also increased. In this latter method care must be taken to get the bars tied together at the point where they are bent as the tensile forces will otherwise tend to pull them out of the concrete.

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*Before the Canadian Society of Civil Engineers.

A similar instance of bad design can be seen in the case of a beam whose tension side is formed by two planes making a reentrant angle and where the bars are simply made to follow the tension side without special arrangement to oppose the secondary stresses at the angle due to the pull in the bars.

As a practical example of a Vierendeel truss in reinforced concrete the following which I personally designed might be considered. It is a skew through bridge, carrying a country road over a double track line of the royal Danish railways. The two trusses have 62 ft. span between center lines of their supports and the clearance between them is 16.7 ft. (drawing A). At the time the bridge was built only one track was in operation, the other one under construction, so that it was only necessary to build a special falsework over that track, allowing for the passage of the trains.

The board of directors called for tenders for a steel superstructure resting on concrete abutments and with concrete wing walls, in accordance with drawings worked out by the railway engineers, but invited at the same time tenders upon the contractor's own proposals, using reinforced concrete either for super or substructure or both, based upon the reinforced concrete regulations of the Danish Society of Civil Engineers, though with the limitation that the allowable compression of concrete was fixed at 500 lbs. per sq. in. and the tension of steel at 14,000 lbs. per sq. in. The live load was given as 100 lbs. per sq. ft. uniformly distributed, combined with one 16,000 lbs. road roller or with cars of 6,000 lbs. load on each axle, to be placed for each truss member in the position which called forth maximum stresses. The maximum distance between the stipulated clearance line for the trains and the crown of the macadamized road was not allowed to exceed 3 ft.

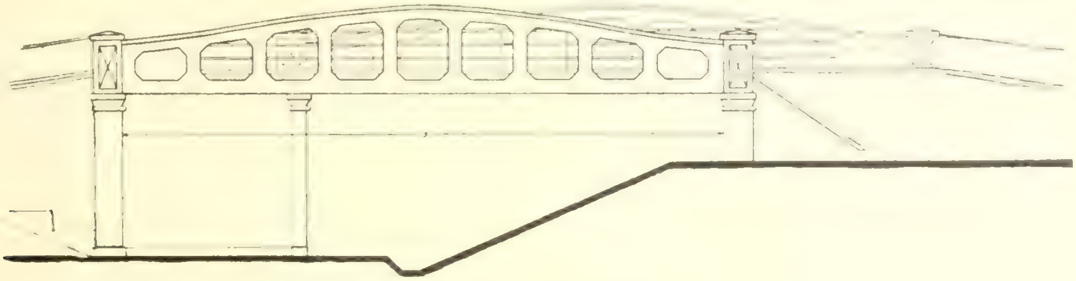
From the schemes submitted for examination the one described below was chosen as it met the requirements called for by the railway engineers and at the same time was the most economical; this proposal was to build the entire bridge, both super and substructure in reinforced concrete and to let the superstructure be carried by Vierendell trusses with curved top chord.

The wing walls which have a maximum depth of 25 ft. from top to soil, were designed in the usual way with a continuous face slab stiffened by buttresses toward the earth, and these ribs again are solidly connected with the heel of the foundation slab, partly by means of their main tension bars partly by stirrups anchored in the foundation slab and projecting into the ribs. To give the wing walls the necessary stability the dimensions of the heel and toe slab were figured to secure a factor of safety against over-turning at least equal to 1.5 and to keep the stress on the ground within the limit of 6,000 per sq. ft. which was found to be the safe loading for that soil. Each of the abutments consists of 2 columns which form the direct support for the trusses and between those columns a slab is constructed stiffened by two vertical ribs built strong enough to resist the earth pressure.

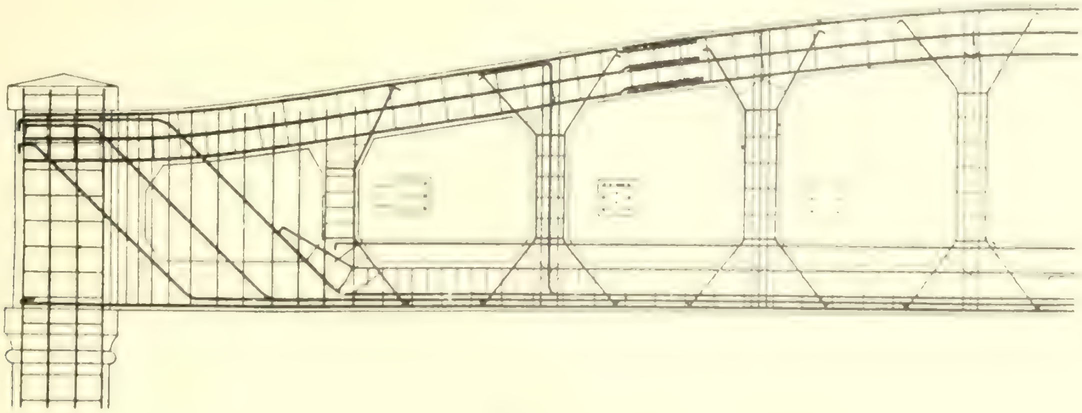
The columns are 36 in. x 15 in. reinforced with 8-7/8 in. bars (all main reinforcing bars in the entire structure are plain and round) connected and held in place during the concreting by bands consisting of 2 out-turns of 1/8 in. wire, the bands being 10 in. apart. They are built in one with the trusses, the column bars being made so long that they reach the upper chord of the trusses, while the truss reinforcing again runs over into the columns (drawing B) in such a way that the bent bars stop in the usual way with hooked ends and the straight bars from the bottom chord are bent around the column bars to ensure a good anchorage.

The earth pressure against the abutment wall is [illegible] over to the two vertical ribs by means of the slab; the ribs for their part are supported at the top by a horizontal beam built together with the bridge floor and at the bottom in another horizontal beam which at the same time forms part of the foundation.

As the bridge is skew [illegible]



Sketch A. Side Elevation



Sketch B

[illegible] force acting in a line parallel with the trusses and one in the plane of the abutment slab, it will be seen how the twisting tendency of that couple is resisted.

Corresponding to the distance between the verticals of the trusses floor beams are arranged with the distance of 6.43 ft. and under a right angle with the trusses, carrying the floor slab with its 8 in. thick macadamizing. These beams are 8 in. wide and 14 in. deep below the 6 in. slab and have 6-⅞ in φ bars with Hennebique stirrups of 1/16 in. x 1¼ in. iron.

Considering the acting forces, dead and live loads and wind pressure, combined with regard to temperature stresses and the stiffness against buckling, the trusses were given the following dimensions: The overall depth midway between supports is 9.51 ft. and at the columns 6.27 ft. The top chord has a depth of 21 in. and a width of 14 in., reinforced with 8 1 in φ bars connected with ⅛ in. wire bands similarly to the column bars. The bottom chord is 18 in. x 14 in. reinforced with 12 1⅛ in. φ bars in the lower side and 4 1 in. φ bars in the upper side; the stirrups are ⅛ in. x 1¼ in. Six of the 1⅛ in. φ bars are bent up under 45° in the first panel of the truss, which is made massive, 2 are bent up in the vertical, nearest to the support, the other 4 follow the bottom side of the lower chord. The verticals are 14 in x 14 in., reinforced by 6 1 in. φ bars and 3 vertical stirrups of ⅝ in. φ bars. The 1 in. φ bars follow the side of the vertical and run on splaying out into the chords, being tied together by ⅛ in. wire bands; the stirrups, whose first duty is to transmit the floorbeam loads to the trusses, are placed around all the bars in the bottom chord and bent around the reinforcing in the top chord. To protect the trusses a granite stone was placed at each vertical to prevent cars from striking them.

The bridge was testloaded very carefully with 250 lbs. per sq. ft.; the loading was applied as well over the total length of the bridge in order to produce the maximum compression and tension in the chords so as in the positions, which give the maximum transversal force for each panel to prove the rigidity of the panel points by calling forth the greatest possible bending moments in the truss members.

Municipal Work at Victoria

City Engineer Rust, of Victoria, delivered an interesting address last week before the members of the Victoria Real Estate Exchange. In regard to the progress of municipal engineering work of the city, Mr. Rust said in part:—

"To date there have been sixty-two miles of roadways laid in this city; ninety-seven miles of sanitary sewers; seventy-seven miles of surface drains; 123 miles of water mains; 120 miles of concrete sidewalks. The total expenditure involved amounts to, approximately, $7,000,000.

Transportation Problem

"Dealing now with the engineering problems which confront us, the first and most important is that of transportation. At the present time the B. C. Electric has within the city limits 29.25 miles of track, which is divided as follows: 4.25 miles of single, and 25.00 miles of double. The rapid growth of the city and the adjoining municipalities, renders it imperative that, if we are to continue to grow, the means of transportation must be materially increased, and I believe that the B. C. Electric is fully alive to this situation, and has in view the construction of several additional lines. Within the next few years there is no doubt that the city will add to these boundaries by taking in Esquimalt, Oak Bay and part of Saanich. I am a firm believer in a "Greater Victoria." The taking in of suburbs is often opposed on the ground that this will throw an additional burden of taxation on the older city to pay for extensive improvements, which will, of course, be needed in the proposed newly annexed territories. There is some truth in this, but it is necessary to consider that municipal policies should be made for the future as well as for the present, and we must take a broad public-spirited view of this matter.

New Territory

"Referring to the annexation of new territory, one great advantage in this is that the sewerage and water schemes can be laid out much more economically and more satisfactorily when a large area has to be deal with. This also applies to educational facilities, fire and police protection, etc. The question of sewerage for these adjoining municipalities is one which will soon require careful attention, and is one which will have to be shortly, we should not request that the Provincial Government at the last session guaranteed the bonds for a very large sewerage scheme for Greater Vancouver, and there is no reason why, when the question of a sewerage scheme for the Saanich Peninsula comes up, which will have to be shortly, why we should not request the government to grant the same privilege to us as they have to Greater Vancouver.

"Dealing with the question of sewerage, the sewering of this city has been one of considerable expense, owing to the adoption of the separate system, and to the very great amount of rock encountered, and a further large sum of money will require to be spent before the city is completely sewered. In Victoria West the present outlets, of which there are several, discharge into the Inner Harbor. It is proposed to remedy this condition of affairs by making one outfall into the sea in the vicinity of Macaulay Point. and into this system it is proposed that the municipality of Esquimalt will drain a considerable portion of their area, and towards which no doubt they will contribute their share of the cost.

The Water Question

"The great increase in the population of the city, and the adjoining municipalities, during the past two years, has taxed the capacity of Elk Lake to such an extent that we have not been able to give the citizens at all times the necessary amount of water, and at the present time during the night the water has to be cut off from the high districts. This is not a proper condition of affairs, and we propose to remedy it by making a temporary connection with the Esquimalt Water Works Company, across the Arm."

In speaking of the Sooke Lake scheme, he said that, as the enoromus increase in land values will shortly make this a serious burden, it will probably be almost impossible in the near future to secure a watershed in fee simple so that it could be properly protected against pollution. The project is to purchase all the catchment area of Sooke Lake, about thirty-one square miles, on which the rainfall is about 55 inches precipitation annually.

In the first installation a dam will be placed at the outlet of the lake to raise the normal level of the water 12 feet, which will give an abundant supply for the delivery of 16,000,000 imperial gallons of water daily to the delivery system of pipes, which consists of a 40-inch concrete main from this dam to the Humpback balancing reservoir, which is within 10¾ miles from Fountain Square in the city of Victoria, where a connection will be made with the pressure main to the Smith's Hill Reservoir. This delivery will be made by a continuous 36-inch steel rivetted pipe of 3/8 and 5/16 plate. With the 12-foot dam, 3,354,706,000 imperial gallons will be impounded, and with the final project, which includes the addition of the water from the Leach River catchment area, there will be 17,359,769,000 imperial gallons. The latter reservoir will raise the lake level 45 feet.

The surface of Sooke Lake is at present 964 acres. At the Sooke Dam there will be provided a series of screens, which will effectually prevent any floating material from entering the pipes. Provision will be made in the gatehouse for the washing of these screens under pressure of water, so that it will at all times be possible to keep them clean.

The 40-inch concrete flow line from the gatehouse will be made in 4-foot lengths, reinforced by wire mesh and locked together by a patent system of bars. The grade for this pipe bed is unique, and very difficult, as the ledges jut out of the rock cliffs for a long distance, giving an 8-foot roadbed. There are also five siphons where the pipe will be under pressure, and must cross the Sooke River and other drainages by steel bridges.

The Humpback Reservoir will store 130,000,000 imperial gallons, or about a month's supply at the present rate of consumption, which would allow of any repairs in case of accident on the flow line. The watershed tributary to this reservoir, about 676 acres, will also be purchased by the city, to provide against any pollution of the water supply. Here again the gatehouse will have screens to effectually prevent any floating material from getting into the pressure pipe, and the water from the flowing pipe will be delivered into this reservoir over a rocky cascade, which will thoroughly aerate and free the water from taste or odour, if any exist. It is to be noted that with the additional development of this project, water will be provided to the city of Victoria at the rate of eighty imperial gallons per day per capita, when it has a population as large as the city of Liverpool, England.

Watershed Acreage

The watershed acreage to be secured at Sooke Lake is about 18,000 acres, and at Leach River about as much more. There are 330 acres in the right-of-way for the flowing grade. The pressure main right-of-way is mostly in the public roads, with the exception of about fifteen acres through private property.

There is nothing so important for a city as an ample supply of water, and a proper method of sewage disposal. People coming to reside in a city naturally enquire as to where we get our water supply and where we put the sewage. With the completion of the Sooke Lake contract, which will probably be in 1915, the city will be assured of an ample supply of pure water.

Marine Drive Project

Victoria lends itself admirably to the construction of a magnificent marine drive reaching from the Outer Wharf to Cordova Bay and Mount Douglas. Another boulevard could also be constructed through Victoria West skirting the southwest boundary of Esquimalt, and then going northerly along the east shore of Esquimalt Harbor, and continuing in a northerly direction to the northeast shore of Portage Inlet. The development of Mount Douglas Park, over which boulevard a street railway line should be built, will be of great benefit to Victoria. These driveways, with the proposed improvement of the Saanich roads, will afford some of the most magnificent drives in the Dominion.

The settlement of the Songhees Reserve is one for which we owe a debt of gratitude to the Provincial Government, and of course will entail upon the city a considerable expenditure, one of which will be the city's share of the new bridge to be constructed across the harbor at Johnson street.

The opening of the Panama Canal and the greater development taking place on Vancouver Island will naturally increase the shipping interests, and with the completion of the railway terminals it will be necessary to have rail connection between the railway terminals and the Outer Wharf. This can probably be better obtained by the construction of a bridge across the harbor at Laurel Point.

The contract for constructing the remaining 425 miles of the Grand Trunk Pacific Railway has been awarded to Messrs. Foley Bros., Welch & Stewart, St. Paul, Minn

Montreal Builders' Exchange

Mr. J. P. Anglin, of Anglins, Limited, was the speaker at the noon-day talk of the Builders' Exchange, Montreal, on March 19th. Mr. T. Gilday presided. Mr. Anglin spoke on modern contracting in the light of costs and estimating. He remarked that in commencing business the modern contractor should take the following things into consideration: Obtain a contract on a definite basis; execute the work called for; record the cost of the work; determine the special charges; the net profits; and is the profit sufficient considering the chances taken? All the contracting business programme to be complete must work into a circle. Mr. Anglin said he was afraid that the question of profit was often entirely left out in figuring out a contract. The careful contractor should never take a job without first preparing a detailed estimate. The gambler would often jump in and secure what should be a nice contract by the short cut method known as cubing. The gambler was the worst enemy of good business; he required three times as much business to make the same profit as the careful bidder, and at the same time pulled down prices to the narrowest margin. The day of rule-of-thumb or take-a-chance method was past, and the contractor with accurate costs and estimates was taking his place. Successful modern contracting was an exact science, but it must be backed up by experience and good judgment.

Mr. Anglin then considered the question of quantities, unit cost of labor, material, price and cartage, sub-contracts, job expense, fixed charges, and profits. He pointed out the unit cost of labour was the most important factor, as it was made variable by the least change in conditions. On the subject of the unit cost of labour, it was remarked that this for standard conditions was best determined by keeping accurate costs of work in progress, and should be reported by a continuous and automatic system, which checked in with the pay roll. Mr. Anglin stated that his firm had employed a check system with great success. Each man had a number by means of which it was known on which class of work he was engaged, and as every man kept his particular number it facilitated the pay roll. Two daily rounds were made on each job, and the daily time reports were sent to the head office. These reports were entered into the cost book and the pay roll, so that the firm were able to know the daily cost of each sub-division of each job.

To get the real benefit, the completed work in the chief items at least should be carefully measured periodically, and the actual cost compared with the estimate units. A set of accurate units of actual cost of each sub-division of every job should be tabulated on a unit card for use and reference in future estimates. The chief points in the contractors' business resolved themselves into a routine which could be best illustrated by a circle, with four broad divisions—execution, estimating, cost and management.

So far as leaks were concerned, the principal were: figuring work not obtainable or out of one's class; mistakes in quantities; lack of experience in the particular work, resulting in improper unit cost; figuring for architects, engineers, and owners who would not see that the contractor had a square deal; and cutting down at the last moment to get a job.

Mr. F. G. [illegible], in proposing a vote of thanks, stated that in Montreal estimating had been much neglected. There were comparatively few successful contractors—men who had made money; on the contrary, a lot of able men had fallen by the wayside, and this he believed was due almost entirely because they had taken work at figures which did not yield a profit. He found that the most successful sub contractors were men who were not high one day and low the next, but men who based their estimates on accurate prices which had been carefully worked out.

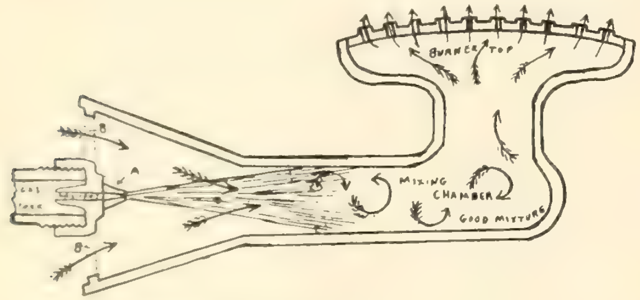
Mr. J. Roberts seconded the vote of thanks.

Proper Gas Piping Specifications in Buildings

by Geo W. Allen*

If architects and builders fully realized the importance of proper gas piping installations there would be less cause for complaint among gas consumers about high gas bills. It is a common belief among plumbers, gas-fitters and others that gas companies desire large gas pipes so that the consumer will use more gas. This is quite erroneous. The writer's own experience with the solving of gas account complaints have in many cases been traced to faulty piping.

All installations for incandescent gas lighting require maximum pressure in order to give maximum service. The large pressure of gas does not necessarily mean a large flow of gas through the burners. But it does mean that if a "pin-head flow" of gas is allowed to enter a Bunsen tube at high pressure a corresponding high pressure suction is set up with the air in the burner, thereby causing a large in-rush of outside air to enter the air mixers and mix with the gas. The result of this is a uniform mixture, and if ignited will give a maximum amount of heat at the burner. It stands to reason, therefore, that if the pressure is checked by reason of small pipes, the gas valves will have to be opened wide at the burner in order to get a sufficient supply. Being a larger volume of gas it is therefore under the same suction pull as the high pressure and the result will be a reduced heat. This means delayed work and a high gas bill. The accompanying cut gives a fair idea of the above reasoning.



A system that ensures a good pressure

"A" shows spud or needle point valve with gas entering burners with force. Having plenty of pressure behind it, it has no need of the valve being turned on unnecessarily full. This stream of gas gradually widens until it fills the diameter of the burner tube and forces the air ahead, consequently drawing in more air to the burner through the air openings marked "B." "B" shows very little air entering the tubes, consequently an imperfect mixture is made, resulting in imperfect combustion and low heating value. Conditions vary in many cases. The ideal way to help remedy gas troubles is to see that proper piping is installed in the first place. The friction in gas pipes grows greater as the pipe sizes are reduced, and, although you can possibly get all the gas you require through it, yet the heating value will be reduced if it entails a longer period in which to do the work it necessarily follows that more gas will be used. For some months the writer used a gas range connected to 3/8 piping 35 ft. long. The result was ample gas for the needs of the home but no pressure. Consequently it took six minutes to boil water, where with the new piping of proper size, three minutes now suffices. Thus there is a saving of fifty per cent. on gas bills.

Incandescent gas lighting is vastly improved by the addition of a trifle more pressure delivered at the burner. The difference in cost between the different pipe sizes is so small that it is hardly worth bothering about, but architects, builders and home owners should see to it that pipes are installed to the following table.

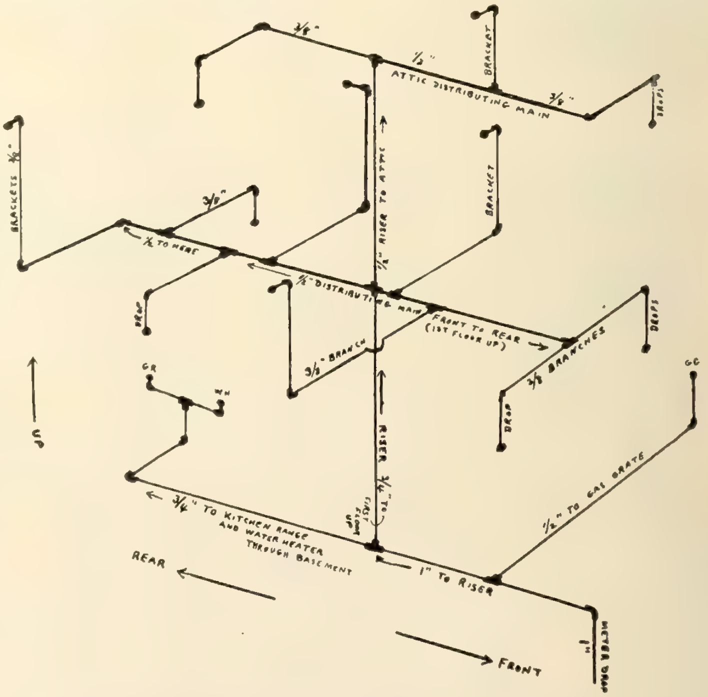
Capacity of House Piping

Diam., Inches	Length Allowed Feet	No. of Burners
⅜	20	3
½	30	6
¾	50	20
1	70	35
1¼	100	60
1½	150	100
2	200	200
2½	300	300
3	450	450

Table showing amount of gas that will be delivered in one hour through pipe of given size and length with a loss of pressure of one inch of water in three hundred feet

Specify gravity of gas		0.42	5	50680.
Diameter in inches	Length in feet	Cubic feet per hour	Cubic feet per hour	Cubic feet per hour
⅜	20	18	15.6	14
½	30	37	32.2	29
.¾	50	101	88	80
1	70	210	180	162
1¼	100	360	310	280
1½	150	577	500	450
2	200	1200	1030	930
2½	300	2050	1800	1610
3	450	3300	2850	2560

One common cause of trouble is in allowing gas-fitters to place pipes of a size sufficient for present requirements only, without any regard for future use whatever. Gas is fast coming to the front both as an illuminant and for fuel purposes, and ample allowance should be made for upstairs sitting room in a home and if a mantel grate is required the usual practice is to connect it with the nearest gas main. The result is—trouble. After the pipe riser is installed (the riser, by the way, should be of a size to carry at least twenty-five per cent. of an overload) the trunk line should be extended from front to rear of the building. Off this individual branches should be installed to their respective outlets, something like the branches of a tree.



The above illustration shows a properly laid-out system of gas piping. Note how evenly it is distributed

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*Advertising Manager, Consumers' Gas Company, Toronto.

Constructional Progress at the Coast

Advent of Spring Brings Promise of Record Activity in All Lines — Features of the Larger Work

Correspondence of The Contract Record

ONLY residents at the Coast can fully appreciate the difficulties that have had to be overcome by builders during the past three months, owing to the extremely unseasonable weather that has prevailed during almost the whole of the period mentioned. Contracts were entered into which did not contain a clause covering the weather item, the result being that when the frost came the builders were forced to proceed with their work because of the insistence of the owners, who had made their plans to occupy the new premises by a certain date. In many cases the prospective profits were seriously reduced owing to the heavy operating cost, but the contractors accepted the situation in philosophic fashion, and made all possible progress.

Now that spring has opened up, a tremendous amount of prospective building not hitherto taken in account, is coming to the attention of Building Inspector Jarrett, who is already in a position to predict that last year's big total in Vancouver proper will be largely exceeded, while in the outlying municipalities, comprising Greater Vancouver, the erection of new residences is already proceeding at a rate that is most unusual so early in the season. This proves that people are anxious to get away from the congestion in the city, where conditions always appear to be about the same despite the thousands of new homes erected during the past three years in Fairview, Mount Pleasant, Kitsilano, Hastings Townsite, etc., and the multiplication of apartment houses. Newcomers to the city invariably reside close in for the first few months, and the demand thus created keeps rents at an unreasonable figure.

Leading architects believe that a feature of the home building trade this season will be the large number of better class residences to be erected. Plans are being prepared for many homes to cost between $10,000 and $20,000, each of which will combine a fine appearance with every interior essential designed for comfort and convenience.

The various builders' supply companies say they are in the best of shape to handle all orders without risk of the annoying delays of last season, due to non-receipt of material contracted for. Warmed by past experience, they have placed heavier orders which are coming forward steadily. As usual, the Seattle market will have to be drawn on heavily for brick, despite the fact that the Coast output has been increased by the addition of several new brick concerns.

New Central Exchange for the B.C. Telephone Company

Plans are almost completed for the new eight-storey central Exchange Building which is to be erected on Seymour street between Georgia and Robson streets, Vancouver, for the British Columbia Telephone Company. The building will be of steel frame and reinforced concrete construction, with exterior facing of pressed brick and terra cotta on the front elevation. The remaining elevations will be faced with brick only. The frontage on Seymour street is to be 50 feet extending back 120 feet to a lane. The main entrance will be elaborately decorated in marble and tile, and only selected woods will be used for the interior finish. The contract for the steel frame has been awarded to a Vancouver firm, and actual construction will be commenced with the least possible delay. This building will accommodate the head office of the company, and will have a capacity of four telephone exchanges, two of which will be installed as soon as the building is completed, the remaining exchanges to be added later. The operating equipment will be of the most modern description, and the completed structure will rank as one of the finest in the city. The cost of the building alone will be approximately $400,000, and when all equipment is installed, the total expenditure is estimated at fully $750,000.

J. Johnston, supervisor of the company's buildings, is preparing the plans, and the engineering department of the company will install the equipment.

Smith & Buckland, contractors of New Westminster, are making rapid progress on the new building which is to accommodate the plant department of the B.C. Telephone Company at the corner of Yukon and Front streets ,Vancouver. The building is of mill construction, and will be six storeys in height. It is expected that construction will be completed about the middle of June. The contract price is $45,000. J. Johnston, supervisor of the telephone company's buildings, was the architect.

Work Started on Hudson's Bay Store Addition

A large force of laborers are now busily engaged in excavating for the foundation of the Hudson's Bay store addition at the corner of Georgia and Seymour streets, Vancouver. The portion now under contract will occupy a space measuring 140 x 175 feet, and will be erected by the local firm of Rourke, McDonald & Moncrieff. When the new addition is completed, the present business will be transferred and the old building demolished, including the adjoining Turner Building on Granville street—also owned by the company. A duplicate of the addition will then be erected on the Granville-Georgia corner. The new structure will be ten storeys in height, of steel and reinforced concrete construction faced with Carrara terra cotta. The appearance of the building will be enhanced by Corinthian columns placed between each section of windows. The total outlay is estimated at $2,500,000. Burke, Horwood, and White, of Toronto, are the architects.

Rapid Progress on New Hotel Vancouver

The old centre portion of the Hotel Vancouver has been completely demolished and Skene & Christie, the contractors, are making rapid progress on the excavation for the Georgia street foundations. In the rear of the hotel, the excavating to a depth of 40 feet is finished, and work is proceeding on the erection of the steel frame. A fireproof building standing eleven storeys in height will replace the old centre portion. After is completion the Granville street wing is to be razed, and a five-storey wing erected on the site. The Georgia street frontage will thus present an eleven-storey tower in the centre, flanked by two five-storey wings. It is estimated [illegible] will be expended before the work is finished.

Messrs. Painter & Swales, Vancouver, prepared the plans.

Important Contracts to be Commenced

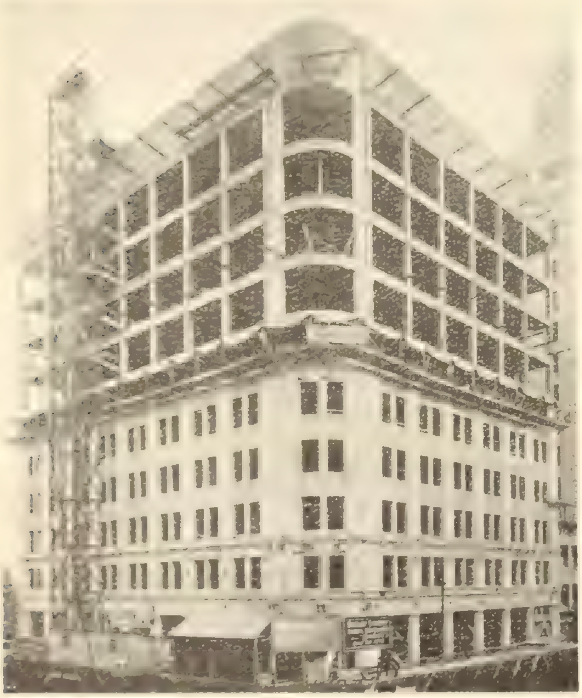
Arrangements are being made to start work on the proposed eleven-storey Weart Building at Vancouver early in April. The structure will be erected on the corner of Hastings and Richards streets, and will be of steel frame and brick construction costing upwards of [illegible] when completed. Russel, Babcock & Rice, Vancouver, are the architects. The name of the successful contracting firm has not yet been disclosed.

Plans are now being prepared by [illegible] for a two-storey steel frame building to be erected for Messrs. [illegible] Bros., Limited, at the corner of Douglas and Kane streets, Victoria, B.C. The building will occupy a space measuring 120 x 120 feet, and is estimated to cost approximately $300,000. Construction work is to commence in the near future.

The provincial department of public works recently awarded the contract for the new provincial jail at Victoria to the B.C. Construction & Engineering Company, of Victoria, the contract price being $223,465. W. Ridgeway Wilson, architect, of Victoria, prepared the plans for the building which will be of reinforced concrete construction, fireproof throughout, with pressed brick and terra cotta, local sandstone, and granite rubble exterior. The structure will be two storeys in height. Construction will commence immediately.

Rapid Progress on Birks Block

Construction work has proceeded without interruption on this important contract since the middle of February, and the front exterior facing of terra cotta is now completed to the full height of ten storeys, while the exterior brick facing on the other two elevations is finished to the full height also. The accompanying illustration shows work in progress on the terra cotta facing. The measurements are 100 x 120 feet. The foundation is of concrete, the superstructure of concrete, terra cotta and brick, on steel frame. The building will be fireproof. The proprietors, Messrs. Henry Birks & Sons, the well-known jewellry firm of Montreal, Winnipeg and Vancouver, will occupy all the space on the ground floor and first floor. The rest of the building will be set aside for offices. The cost of the entire structure is placed at approximately $500,000. The Norton Griffiths Company were the contractors for the steel frame and concrete work. Bentley & Company, Vancouver, are now carrying on the remainder of the construction. Messrs. Somervel & Putnam, Vancouver, were the architects.



Progress view Birks Block, Vancouver

Much Building Work Under Way

A new three-storey and basement building is now being erected on Water street, Vancouver, by Oscar Brown & Company, wholesale fruit and produce merchants. The new building will replace the firm's one storey structure on the same site, and will measure 33 x 100 feet, extending back from Water street to the C. P. R. tracks. The building is to be of reinforced concrete construction, with pressed brick exterior, trimmed with stone. The entire ground floor space will be utilized for the handling of goods for quick delivery. Part of one of the upper floors will be used for the offices and the balance for the storage of staples that do not call for quick handling. It is expected to have the new building ready for occupation when the summer fruit rush commences.

One of the most notable features of building construction at Vancouver is the large number of rooming houses which are to be found in various stages of erection in almost every quarter of the city and suburbs. The demand for this class of building is steadily increasing, and it is safe to predict that a much greater number will be erected this year than in any previous twelve-month period. While it can be truthfully stated that many of these structures at present standing possess little attraction from an architectural standpoint, a noticeable improvement is nevertheless steadily taking place in the manner of designing and methods of construction. The two recently erected rooming houses, described herewith are indicative of the progress being made in this type of building at the Coast.

Ailsa Lodge

This is an up-to-date mill construction building situated in the 1000 block Melville street, overlooking Burrard Inlet, Vancouver. The measurements are 33 x 132 feet. The exterior facing of the front elevation is light colored pressed brick, trimmed with stone. The remaining elevations are faced with common red brick. The entrance is decorated in marble and tile; all inside finish is fir. The ground floor space is occupied by a cafe with lounge attached, the ceiling height of both rooms being 17 feet. In the lounge is a spacious red brick fireplace of old English design. The upper floors contain 70 rooms for bachelors. Each apartment is fitted up in a complete manner with private telephone, hot and cold water, steam heat, etc. The cost of this structure complete was $35,000. Mr. J. Y. McCarter was the architect, and the Dominion Construction Supply Company were the contractors.

Harbor Rooms

This building is of mill construction, and is located on Cordova street. The measurements are 25 x 132 feet. The front exterior facing is white pressed brick with terra cotta trimmings. The entrance is finished in marble and tile. B.C. fir is used as inside finish throughout. The three upper floors contain 50 rooms, and the ground floor is occupied by a cafe. All rooms are replete with modern requirements. The building is heated with steam. The estimated cost was $30,000. J. P. Matheson & Sons were the architects, and the Dominion Construction Supply Company had charge of construction.

Plans were recently completed at Vancouver for a four-storey reinforced concrete and mill construction block to be erected for the Standard Trust & Industrial Company on Seymour street at an approximate cost of $50,000.

Construction work will soon be completed on a two-storey steel and mill construction building which is being erected in the 800 block, Granville street, Vancouver, for the Pacific Amusement Company. The building occupies a lot measuring 50 x 120 feet, and will be used as a moving picture theatre. The exterior facing on the Granville street frontage is pressed brick trimmed with terra cotta, the remaining elevations being faced with common brick. The entrance measuring 14 x 47 feet is flanked in white Alaskan marble with tile floors. An art glass frieze in three panels, symbolic of the industries of the province, extends across the rear of this lobby. Interior seating accommodation is provided for 1,000 persons, all seats being of the latest theatre pattern. To ensure a clear view of the screen, a seven foot slope has been built in the auditorium. Ornamental plaster is to be used for interior decoration, and all wood finish will be B.C. fir. The lighting system is of the semi-direct pattern. The proscenium opening which will contain the screen, will measure 30 feet x 30 feet in size. Retiring rooms for both sexes will be provided on each floor. The theatre is designed with eight exits, four to the lane, and four to Granville street. Hot water will be used for heating and a suction fan ventilating system will be installed. The cost is estimated at approximately $75,000. C. P. Gregory prepared the plans for this building. The contractors are Messrs. Williams, Smith & Thompson.

New Forestry Building

The new forestry building to be erected by the Vancouver Exhibition Association, at Hastings Park, will be typical of the great industry it is to represent. The building will suggest the type of architecture from which the Greek Doric style was originally developed, when timber instead of stone was employed in the construction. The only materials to be used in this structure will be British Columbia fir. As much of this as possible will be used in the natural state. There will be sixteen huge fir pillar logs set across the main facade of the building. The pediment which will surmount the main entrance, will be constructed of squared and rounded tree trunks and split logs. The spaces between the pillars on either side of these entrances will be filled by old-fashioned cedar shakes. The interior of the structure will consist of a large hall measuring 80 feet by 190 feet, with a gallery running around all four sides. This hall will be used for the display of every known wood found in B.C. It is understood that the greater portion of the timber to be used in the construction of the building, will be donated by the lumber manufacturers of Vancouver. Messrs. Stuart & White, Vancouver, are the architects. The cost is estimated at approximately $22,000.

Forestry Building, Hastings Park, Vancouver

Construction work will commence shortly on the new Transportation Building which is to be erected at Hastings Park for the Vancouver Exhibition Association. The measurements are 144 feet x 316 feet, and the structure will be one-storey in height. The materials to be used in the construction will be B.C. fir, covered with metal lath and stucco. On each side of the main entrance, on the front elevation, there will be an 88 foot tower, while 66 foot towers will be erected on each of the four corners of the building. A fan light of glazed glass and ornamental stucco will be placed over the main entrance. Ornamental stucco will also be employed for the interior decoration. As in the new Forestry Building, the interior will consist of a large hall which can be partitioned off at the discretion of the exhibition management. The cost will be approximately $27,000. Mr. Otto Moberg is the architect.

Construction will be commenced at an early date on a new eight-storey building to be erected on the corner of Sixth and Columbia streets, New Westminster, for the Dominion Trust Company. The new structure will be similar in design to the building recently completed for the company in Vancouver, and is to be of reinforced concrete construction with exterior facings of pressed brick trimmed with stone. The entire ground floor space will be occupied by the local offices of the company.

Plans were recently completed for the new machine shops and foundry to be erected for the Heaps Engineering Company, on Lulu Island, close to the city of New Westminister. The machinery of the present Schaake Machine Works at New Westminster will comprise part of the plant, and it is planned to eventually install equipment to the value of $400,000. The buildings will form a triangle, and will be erected in the following order: General office, two storeys, 48 feet by 42 feet; pattern shop, 94 feet by 99 feet; foundry, 200 feet by 80 feet; machine shop, 300 feet by 90 feet; warehouse, 200 feet by 112 feet, and another building 140 feet by 131 feet. The boiler house will be 59 feet by 23 feet, and the blacksmith shop 39 feet by 60 feet; fuel house, 29 feet by 29 feet. The Heaps Company will cut the timber at their own mill, and propose to do all the work by day labor.

New Hospital Nearing Completion

The fine weather of the past few weeks has enabled the Norton Griffiths Steel Construction Company to make fast progress on the construction of St. Paul's new hospital on Burrard street, Vancouver. The exterior facing of pressed brick with terra cotta and stone dressing is now almost finished, and no time will be lost in rushing the remainder of the building to completion. The design of this building is in Italian Renaissance. Its length is 200 feet, and the height five storeys. The construction is reinforced concrete. The cost is estimated at approximately $450,000. Mr. R. F. Tegen is the architect.

An Up-to-date Garage

The new garage of the Begg Motor Company on the corner of Thurlow and Georgia streets, Vancouver, has a frontage of 66 feet on both Georgia and Alberni streets, and is 132 feet in length. Although originally designed as a five-storey structure, only three floors have been constructed at present, the remaining floors to be added when required. The building is of reinforced concrete construction throughout, and is faced with white enamel brick on the street frontages and common brick on the sides. The ground floor space is used for storage and office rooms, the floors in the office rooms being of terrazzo tile. Retiring rooms, smoke rooms and a large lounge are equipped on this floor for the [illegible]

[illegible] staff as well as a reading room for the [illegible] chauffeurs. The mezzanine floor is occupied by offices, the second floor is utilized as a large store room and the third floor is occupied by the repair department and stock department. There are concrete washtubs on each floor. B.C. fir has been used as inside finish throughout. The indirect system of artificial illumination has been installed in the sales rooms. The building is heated by steam throughout. Two car elevators and one passenger elevator provide communication between each floor. The total cost was $70,000. Mr. J. Y. McCarter was the architect, and the Dominion Construction Company had charge of construction. Rapid construction work was a feature of the latter company's contract on this building, over 350 yards of concrete being poured in one day of nine hours.

New Industry for Coquitlam

The Pacific Dredging Company of Portland, Ore., has purchased nine acres on the Pitt River waterfront, adjoining the Coquitlam Shipbuilding & Marine Railway Company yards, and will establish there a large dredging plant at a cost of approximately half a million dollars. Work is to be commenced immediately on a machine shop marine slip, and all the attendant buildings necessary for a large and modern plant. The president of the company, J. L. Davidson, stated recently that at least 100 men would be employed in the construction of the plant this summer. The company already owns three big dredges and the necessary accessories, and one of them, the Beaver, is now on the Fraser River. A large shipment of pontoons, 4,000 feet of pipe, fuel, scows and other supplies arrived in advance of the Beaver. An order has been placed for a 110-ton seven yard dipper dredge, which is to be delivered within two months. All the employees of the company will reside in Coquitlam.

The health committee of the Vancouver City Council recently instructed City Engineer Fellowes and Dr. Underhill, the city health inspector, to prepare plans for five sanitary conveniences which are to be erected in various parts of Vancouver in the near future. The appropriation for this work is $55,000.

The B.C. Transport Company of New Westminster will shortly erect an up-to-date brick plant near this city on a location yet to be chosen. The new industry will be known as the Glenbury Brick Works. The kilns will be supplied with an oil burning and heating plant, and the machinery will be operated by water power if an available location is found. Mr. T. H. Pearson, who has been in charge of a large brick works in England for some years past will superintend the construction, and will assume management of the new plant when completed.

Brick Duty Removed

The removal of the customs duty upon vitrified brick for paving purposes, which is reported to have been made by the Dominion government, is likely to materially aid in the work of highway construction in Saanich, near Victoria, B.C., as that municipality has decided in favor of vitrified brick as against stone or wood. In this connection, it is reported that efforts are being made to form a company of Victoria capitalists to import vitrified brick from Seattle, there being no manufactory of the material anywhere in Western Canada.

The Victoria School Board were recently approached by the local chapter of the B.C. Society of Architects to stop the procedure by which a single architect has acted for the board, and to call for competitive designs in future. The School Trustees decided to call for designs in competition among local architects, after the schools at present under construction have been completed. It is interesting to note in this connection, that only recently the Vancouver board of School Trustees refused to consider a similar recommendation from the Vancouver Chapter of B.C. Society of Architects. C. L. Morgan, a recent arrival from England, being appointed architect to the board at a moderate salary.

A commission composed of the members of the Point Grey School Board and Mr. W. T. Whiteway, representing the B.C. Society of Architects, recently made the following awards in connection with the plans for the proposed $60,000 eight-roomed school at Magee: First prize, Mr. Claude P. Jones, of Jones and Beatson, $300; second prize, Mr. Joseph Wilson, of Wilson & Wilson, $150; third prize, Mr. W. P. White, $150.

Mr. D. B. McLay, a member of the Vancouver City Engineers staff, has been appointed to take charge of the board of works construction department, Vancouver, at a salary of $2,000 per annum. Superintendent Norton, who has previously been in charge of construction work, will assist Mr. McLay, and will receive the same salary.

F. H. Sprague, of Vancouver, was recently appointed consulting heating and ventilating engineer to the Vancouver School Board. Mr. Sprague was given a retainer, and will operate on a 3½ per cent. commission basis.

Mr. N. A. Leech, until recently architect to the Vancouver School Board, has opened offices in the Crown Building on Pender street. Mr. Leech reports a good volume of business on hand.

Messrs. Sharpe & Thompson, architects, Vancouver, have removed from their former quarters in the Old Safe Block to the new London Building on Pender street.

According to reports from St. John, N.B., the Canadian Pacific Railway will spend a million and a half in that city and vicinity during the coming season. It is stated that the largest single item to be spent is one of about $630,000 towards the cost of the new grain elevator at West St. John, its power house, yard and track facilities in connection with it.

The Late Mr. Geo. H. Pedlar

The death of Mr. Geo. H. Pedlar, the head of the well-known Oshawa firm, The Pedlar People Limited, has deprived the Canadian constructional field of one of its most familiar figures. The late Mr. Pedlar, who was in his seventieth year, started business with his father in Oshawa in 1861, manufacturing tinware. He is stated to have been the originator of the "go-after-the-order" plan of campaign. In 1892 he established the Pedlar Metal Roofing Company, which from a humble beginning prospered until it became ultimately the largest plant of its kind in the British Empire. Mr. Pedlar had surrounded himself with a competent staff of young and energetic salesmen and upon the death of his son, Mr. Geo. H. Pedlar, Jr., formed a joint stock company. The late Mr. Pedlar was of a charitable but retiring disposition. He is survived by a widow and two daugthers.

The late Mr Pedlar

Mainly Constructional

The News in Brief—From Coast to Coast

The Board of Control of the city of Toronto recently decided to build the Bloor street viaduct of steel.

The government of New Brunswick will spend $100,000 per year for permanent work on roads in the province.

The members of the Builders' Exchange of Toronto held a social evening on March 27th. About two hundred attended.

Realizing the benefits accruing from good roads, a good roads campaign will be inaugurated in Calgary this summer by the Board of Trade.

The ratepayers of St. Catharines, Ont., recently voted against the by-law to build a viaduct across the old Welland Canal to the Grand Trunk Station.

Building permits issued at Peterboro, Ont., for the first two months of 1913 amounted to $12,900, an increase of nearly $9,000 over the similar period in 1912.

When bids for sewers in 19 streets were opened in the City Hall, Montreal, it was found that contractors were in every instance lower than the city engineer.

The Government of Alberta have decided to expend $5,000,000 on improvements, the chief of which will be telephone extensions and roads improvement.

Contracts were awarded recently for the new Ladies' College at Ottawa. The estimated cost of this building is $130,000. The architects are Messrs. Keefer, Richards & Abra.

The head office of the Consolidated Stone Company has been removed from Chicago to Bedford, Ind. The company is retaining a sales office at 326 Monadnock Block, Chicago.

The Industrial Building Company, Limited, Toronto, have practically completed negotiations for the purchase of a site for their new building which they purpose erecting at a cost of $390,000.

The directors of the National Brick Company of Laprairie have declared a bonus of 1¼ per cent. for 1912, and placed the stock on a regular dividend basis of 5 per cent. per annum for the current year.

Work on the new Methodist Book Room building at Toronto will be commenced on May 1st next and it is hoped to complete the structure by September 1st, 1914. The cost of the building will be $1,000,000.

The annual convention of the American Society of Municipal Improvements will be held at Wilmington, Del., October 7-10, 1913. Mr. Alcide Chausse, of Montreal, is on the Society's committee of fire prevention.

There is a decrease of $1,100,000 in the [illegible] building permits of western cities as compared with the same month of 1912, which amounts to 27 per cent. Eastern cities, however, show an increase of 20 per cent.

The contract for the erection of St. Chad's College, Regina, has been awarded to Mr. R. J. Lecky, his tender for the work being $90,339. It is expected that building will be commenced as soon as the materials are on hand.

The Greater Montreal Planning and Household Association is the name of a new [illegible] [illegible] to secure better housing conditions for the working class and to [illegible] a thorough revision of the building and health by-laws.

The Cedar Valley Brick Company, Limited, Toronto, report that their plant at [illegible], Ont., will be in operation within the next two weeks. They will start with two sets of machinery and expect to turn out 40,000 bricks in a ten-hour day.

According to a Quebec despatch, the nine new tenders for water bound macadam which were received for the highway between Quebec and Montreal, were all too high. No action will be taken until the Premier, who is in Europe, has been communicated with.

The total building permits at Toronto for February, 1913, was $1,549,210, as compared with $1,333,915 for the corresponding month of 1912, and for the two months of 1913, $2,825,294, as compared with $2,108,080 for the same period of 1912.

Contracts have been let for the new Ladies College at Ottawa, and work will be started at once. The building will be furnished with all up-to-date equipment and will be fireproof. The cost of the building and site will be approximately $130,000.

The Saskatchewan Iron and Bridge Company have decided to build a plant at Medicine Hat. The city has made them a grant of fifteen acres and the usual light, water and power concessions. The work on the buildings, which will cost $100,000, will be commenced on or before June 1st.

The City Council of Toronto recently adopted the Works Committee's report in favor of extending Terauley street at a width of 86 feet from College street north to Davenport road, and widening Yonge street to a width of 86 feet from Bloor street to the present northerly limits of the city. The approximate cost of these improvements is estimated at $2,642,983.

The Metropolitan Parks Commission are working out a general plan of improvements for the island of Montreal, and they are asking the assistance of the municipalities to pay for the preliminary expenses. Included in this plan is a provision for the construction of an underground tramway system, playgrounds, streets, boulevards, and outside the limits of the city good roads.

The National Builders' Supply and Concrete Brick Company, with the head office at Montreal, have secured land at Mascouche, P.Q., for the construction of a single unit brick plant. Similar plants will be erected at Toronto and Ottawa, and later at Vancouver. Enamel bricks, rough and smooth finish, in all colours will be produced. The company propose to increase the capital to one million dollars.

The town of Yorkton, Sask., is arranging for the raising of $100,000 for the construction of a water works plant and reservoir adequate to the needs of this rising young city. The scheme is to construct a dam across a ravine to the west of the town, connect same with a pipe line from York Lake, erect a pumping and filtration plant there, and thus ensure for the town a water supply that will be both ample and pure.

[illegible] Montreal, [illegible] on a city contract for laying a new 36 inch steel water pipe from Point St. Charles to the McTavish reservoir. The pipes will be placed three feet below the Lachine Canal, and will be tapped in two districts, the surplus being pumped into the reservoir. The work will cost $100,000. The new [illegible]

C. J. Wills and Sons, of London, Eng., have entered an action against the [illegible] Railway Company [illegible] deposit of $750,000 in an English trust company. Messrs. Wills are the contractors for the line, and have constructed a portion at a cost of about $230,000. They claim that the company agreed to deposit in the heads of an English trust company sufficient funds to cover the cost of the line, and [illegible] work was commenced. This, it is said, has not been done, and they ask for fulfilment of the promise, and also that the defendant company be prohibited from completing or constructing the railway or obtaining other contractors to do the work and that plaintiffs be allowed to complete the work. The railway company state that there has been unnecessary delay on the part of the contractors, that the contract has been taken out of the latters' hands, and damages of $100,000 are claimed.

The million dollars which the Ontario Provincial Government will spend on good roads will be spread over the whole great north country, with Temiskaming getting the largest single portion. The district gets $350,000, of which $75,000 goes for roads along the main line and branches of the T. and N. O. extending west as far as the Montreal River and east for about twenty miles. Gowganda and Swastika districts will also get short roads.

The latest report with regard to progress on the Grand Trunk Pacific main line eastwards from Prince Rupert, states that trains are running on schedule between that place and New Hazelton, while steel has been laid as far as Porphyry Creek, nearly twenty miles further east. Grading has also been completed as far as Telkwa, which is sixty miles east of Hazelton. From Fort Fraser to Fort George grading has been done on a 14-mile strip but the remaining forty-five miles is untouched.

A deputation recently waited on the Ontario Provincial Government seeking approval of a proposed bill to incorporate a large housing scheme. The plan, as outlined to the government, is to incorporate a company with $500,000 capital, $75,000 of which will be subscribed in cash by private individuals and the remaining $425,000 represented by bonds. The houses will be rented to workingmen as cheaply as possible, and the profit-sharing capacity of the concern will be limited to six per cent. The government is to be asked to guarantee the bonds, but the municipalities will be liable to meet any deficit.

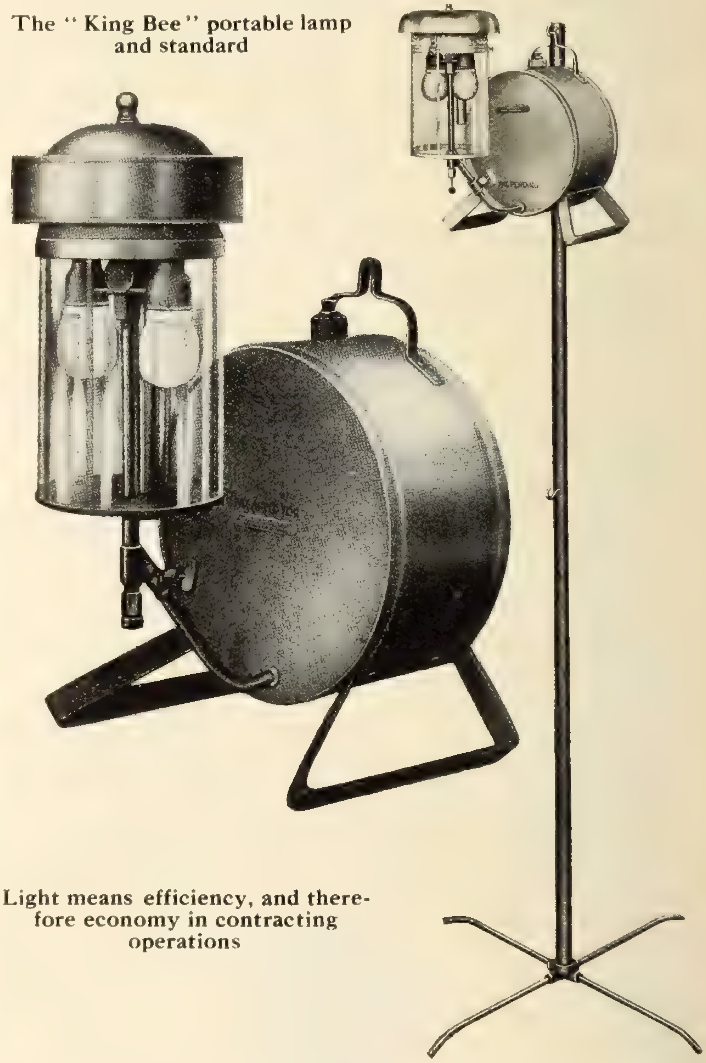
A pamphlet descriptive of the Napanee rock drill (Lecky & Collis, Limited, Napanee, Ont., and 335a Craig street west, Montreal) deals with a product that represents the gradual evolution of rock drill construction during a period of over twenty years' experimental work. The strong points about the Napanee drill are its simplicity, strength of design and efficiency in service. Every drill is thoroughly tested under steam or air before shipment. The constructional features of this drill as detailed in the booklet are worth a careful study on the part of the reader. Messrs. Lecky & Collis will be pleased to furnish catalogues and full information upon request.

It is announced that the end of the present year will see the completion of the Esquimalt and Nanaimo Railway on Vancouver Island, one of the subsidiary lines of the Canadian Pacific Railway. A shipment of a thousand tons of steel rails from the steel works at the Canadian Soo have been received and these will be laid as quickly as possible. Fifteen miles of the line north of Parksville have been graded and construction of the remaining thirty miles is in progress. A 60-pound rail will be laid. Surveys of the line some distance beyond Comox have been completed, and a good deal of exploratory work in the northern portion of the island has already been accomplished.

The Grand Trunk Pacific Railway is planning to spend $2,000,000 on its hotel and terminal facilities at Regina. Plans, it is reported, have been completed for a five storey station building of similar architectural design to the 'Qu'Appelle,' the company's $1,000,000 hotel to be erected in Wascana Park, directly opposite the station, and connected with it, as in the case of the Chateau Laurier, by an underground passage, thus making it unnecessary for travellers to leave shelter between the train and their rooms. Tenders are shortly to be called for and the work will be pushed in order to have the station ready for occupation by next autumn if possible. At the rear of the station will be erected a power house for the needs of both station and hotel, and a laundry will be housed in a separate annex to do all the laundry work for the division. The $2,000,000 estimate does not include the landscape gardening and tree planting by which it is proposed to make the Grand Trunk Pacific terminals one of Regina's beauty spots.

An Efficient and Economical Light for Contractors

THE accompanying illustration shows the "King Bee" portable lamp and Standard supplied by Messrs. F. H. Hopkins Company, Imperial Bank Chambers, Montreal. This lamp has strong claims upon the contractor. It requires no wiring and it gives the same illumination as the strongest arc lamp, at one-tenth the cost. It gives a strong, steady light, which facilitates the operations of workmen and produces better results. It is both rain-proof and wind-proof and there is no glassware about it to break. The chimney is made of mica and the tank of heavy, galvanized iron, the lamp holding one gallon of gasoline. The fixtures are of the strongest seamless tubing and the cap is of spun brass. The "King Bee" has become deservedly popular because it saves the expense of wiring the job ahead of the workmen and gives all the light required where it is needed most. It is particularly handy and adaptable, and can be carried, set down or hung up anywhere.



The "King Bee" portable lamp and standard

Light means efficiency, and therefore economy in contracting operations

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

Trunk sewer. Tenders will be received by Clerk, A. H. Miller, up to April 17th for (a) supply of approximately 11,913 lin. ft., 48 in. reinforced concrete sewer pipe, (b) supply of approximately 3,265 lin. ft. 30 in. salt glazed, vitrified sewer pipe, (c) laying of approximately 11,913 lin. ft. 48 in. concrete sewer and approximately 1,074 lin. ft. 30 in. sewer, (d) laying approximately 2,191 lin. ft. 30 ni. sewer and approximately 5,393 lin. ft. 18 in. sewer pipe. Plans and specifications at office of Engineer, Herbert Johnston.

London, Ont.

Plans will be prepared at once and tenders called for new sewers on Chesley avenue, Lyle and Adelaide streets. Mayor, C. M. R. Graham. Engineer, H. A. Brazier.

Melbourne, Que.

Macadamizing roads. The council is making arrangements to borrow $50,000 from the Prov. Govt. under the Good Roads Act; will also purchase road making machinery. Address Secretary for further information.

Moose Jaw, Sask.

Sewers and watermains, extension 25,940 ft., cost $173,000, planned by the city council. Clerk, W. F. Heal. By-law passed.

Ottawa, Ont.

Street improvements planned by town of Eastview. Mayor, C. Gladu, McArthur Building.

Conduit system, Rideau street, etc., contemplated by Ottawa Electric Company, Sparks street. Engineer, Supt. of Company, Sparks street. Permission granted by city.

Prince Albert, Sask.

Trunk sewer extension, cost $46,700, planned. By-law passed by council also to lay 4-in., 6-in. and 8-in. tile and cast iron pipe on various street, cost $235,640. Mayor, N. W. Morton. Clerk, C. O. Davidson. Engineer, M. H. Baker.

Extension to waterworks system, cost $135,000, planned by City Council. Mayor, N. W. Morton. Clerk, C. O. Davidson. Engineer in charge, J. E. Askwith. By-law passed to lay lead and cast iron pipe, 5/8-in., 3/4-in., 1-in. 2-in., on various streets.

Stratford, Ont.

Main sanitary sewer, cost $11,546.70, contemplated by the Board of Works. Chairman, H. Pauli. City Engineer, A. B. Manson. Tile construction, 16-in. & 12-in. vitrified tile, plain brick manholes.

St. John, N.B.

Water and sewage system, Douglas ave., planned by City Council. Commissioner of Water and Sewerage, R. Wigmore. Engineer, W. Murdock, City Hall. Tenders will be called shortly.

Saskatoon, Sask.

Waterworks pipe and supplies required by City Commissioners. Secretary, Geo. Johnstone, F. E. Harrison, W. Byron Neil. Engineer, Geo. T. Clark. For contract No. 132, furnishing and delivery of 130 gate valves, sizes 6-in. to 24-in. Contract No. 133, furnishing and delivery of 75 fire hydrants. Contract No. 136, furnishing and delivery of approximately 10 miles cast iron water mains and necessary specials, ranging in sizes 4-in. to 24-in. Specifications at office of engineer. Tenders received until April 15th.

Toronto, Ont.

Waterworks supplies. Tenders received by Board of Control, Waterworks Department, up to April 8th for the following: 24-in., 30-in., 36-in. and 42-in. valves; 36-in. check valves; 24-in. 30-in., 36-in. and 42-in. cast iron special castings. Specifications, etc., at Waterworks Section, Dept. of Public Works, City Hall. H. C. Hocken, Mayor.

Vancouver, B.C.

Concrete sidewalks, cost $25,000, throughout the grounds of the Vancouver Exhibition. Clerk, Wm. McQueen. Tenders will be called shortly.

Yorkton, Sask.

Reservoirs, waterworks, etc., cost $100,000, contemplated by City Council. Town Clerk, F. T. F. Atcheson. Engineer, Talbot Crosbie. Scheme comprises dam across ravine pipe line to York Lake, pumping and filtration plant. By-law will be submitted.

CONTRACTS AWARDED

Hamilton, Ont.

Electric pumping station, cost $20,000, planned by Board of Control. Mayor, John Allan, City Hall. Architect, W. A. Edwards, 7 Hughson street east. General contractor and mason, Geo. E. Mills, 614 King street east. Carpenter, T. J. Drake, 47 Earl street. Roofing, Thomas Irwin & Son, McNab street S. Painting, J. Cook, care architect. Heating, Adam Clark, Main street west.

Montreal, Que.

Sewers. Engineer in charge, [illegible] Janin, City Hall. Contract was awarded to Palermo & Frascarello, 422 Cadieux, for sewers in the following streets: Hingston, $2,253; Godfrey, $2,622; Notre Dame de Grace, $1,105; Robin, $987; Vitre, $2,259, and Arcade, $2,420.

St. John, N.B.

Water main, cost $[illegible],000. Engineer, Henry Holgate, Richelieu Bldg., Victoria Sq., Montreal. General contractor, James E. Kane, 1 Lowell street W.E., 12-in main from Marsh Bridge to Ballast Wharf ,to supply the Atlantic Sugar Refinery Co. Work to start at once.

Welland, Ont.

Concrete sidewalks, cost $10,000. Clerk, George Boyd. Engineer in charge, D. T. Black. General contractors, Somerville & Reid. 12¾c sq. foot, 18c crossings.

Railroads, Bridges and Wharves

Province of Alberta.

Alberta Central Railway Company's revised location of railway from a point in Section 3-39-4 W. 5 M. at mileage 40 (from Red Deer) to a point in Section 22-39-7 W. 5 M. at mileage 60 has been approved.

Bolton Centre, Que.

Bridge planned by Municipal Council to replace "David Holland" structure, swept away. Further particulars from Sec.-Treas., Bolton Centre.

Burlington, Ont.

Concrete revetment wall. Tenders will be received by Dominion Government, Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, until April 21st. Plans, specifications, etc., at office of J. G. Sing, District Engineer, Confederation Life Bldg., Toronto; H. J. Lamb, District Engineer, Windsor, Ont., Postmaster, Burlington, and Department, Ottawa. Specifications also at MacLean Daily Reports, Toronto.

Cape Tormentine, N.B.

Car Ferry Terminal, Dominion Government, Dept. of Railways & Canals. Secretary, L. K. Jones, Ottawa. Time extended for receiving tenders until April 15th. Plans, specifications, etc., at office of chief engineer of Department of Railways & Canals, Ottawa; Chief Engineer of the Intercolonial Railway, Moncton, N.B.; Horace McEwen, Supt. of Prince Edward Island Railway, Charlottetown, P.E.I., and at office of the I.C. Railway Ticket Agent, 107 Hollis street, Halifax, N.S.

Glen Allen, Ont.

Steel bridge, County of Wellington, 157 feet long, concrete floor. Engineers, [illegible] & [illegible], [illegible] street, Toronto. Tenders received until April 5th by C. G. Stickney, Winfield, Ont. Same may also be handed in at the letting at Grayton up to April 7th. Plans, specifications, etc., at office of engineers, Toronto.

Inverness, Que.

[illegible] planned by [illegible] Council. [illegible], Plessisville. Architect, A. A. Kinnear. [illegible]

Kinnears Mills, Que.

[illegible]

[illegible] bridge swept away recently. Address Secretary, Kinnears Mills.

Mansonville, Que.
Iron bridge with concrete abutments will be erected this coming summer. Municipal Council. Mayor, Bullard, Brome, Que. Engineer L. A. Vallee, Government Engineer, 80 St. Cyrille, Quebec.

Metcalfe Twp., Ont.
Tenders will be received by Township Clerk, Richard Ward, Glencoe, until April 7th for the erection of a number of steel and concrete culverts, 10 ft. x [illegible] ft. in Metcalfe Township.

Maniwaki Reserve, Que.
Steel highway bridge, County of Wright. Tenders received by Dominion Government, Dept. of Indian Affairs. Secretary, J. D. McLean, Ottawa, until May 3rd, for construction of bridge over [illegible] Creek. Further information at his office.

Medicine Hat, Alta.
Bridge and iron works, cost $100,000, planned by the Saskatchewan Bridge & Iron Works, Moose Jaw, Sask. Site of 15 acres has been secured and an agreement signed with city.

Moorefield, Ont.
Reinforced concrete arch, 80 feet long, for Twp. of Maryboro. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Tenders received by R. McArthur, Moorefield, Ont., until April 5th. Same may also be handed in at the letting at Grayton up to April 7th. Plans, specifications, etc., at office of engineers, Toronto.

Ottawa, Ont.
Round house and car shops planned by Canadian Northern Railway, head office, Toronto, in Rideau Township. Work to commence in spring.

Fisheries patrol steamer. Dominion Government, Dept. of Marine & Fisheries. Deputy Minister, Alex. Johnston. Tenders received by Deputy Minister until noon April 25th, for the construction of a steel wood sheathed twin screw patrol steamer, to be delivered at Selkirk, Manitoba. Length B.P. 140 feet, extreme breadth 27 ft. 3/4 in., depth moulded, 13 ft. 6 in., indicated h.p. 900. Plans, specifications, etc., at Department, Ottawa, offices of the Collectors of Customs at Toronto, Collingwood, Midland and Kingston, Ont., at the office of the Harbor Masters, Port Arthur, and Fort William, with agents of Dept. at Montreal, Que., St. John, N.B., Halifax, N.S., and Victoria, B.C.

Revenue, Sask.
Canadian Pacific Railway Company's proposed location of station on Section 35-37 21 W. 3 M. at Revenue, Sask., has been approved.

Ste. Anne des Plaines, Que.
Iron bridge, "Lacorne Creek," planned by Municipal Council. Tenders will be received by Secretary-treasurer up to April 30, 1913.

St. Monique, Que.
Bridge planned by Municipal Council, over Nicolet River. Address Secretary, St. Monique.

CONTRACTS AWARDED

Moncton, N.B.
Concrete arch culvert, cost $5,000. Provincial Government, Dept. of Public Works. General contractor, Ashley A. Jolter, Keswick, N.B. Concrete arch culvert and highway road diversion.

Montreal, Que.
Addition to Angus car shops of Canadian Pacific Railway. Builders, D. G. Loomis & Sons, St. Patrick ave. Gen. Supt., Lacey R. Johnson. Sub-tenders received by general contractors. One storey, 600 x 150, concrete foundation, structural steel and solid brick construction, felt and gravel roofing.

Ville Marie, Que.
Wharf, cost $17,972. Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, M. R. Brewder, Ottawa.

Public Building, Churches, Schools, etc.

Province of Alberta.
Farm buildings planned by Canadian Pacific Railway, Dept. of Natural Resources. Supt. of Development branch, James Hart. For the erection of eighty sets of ready-made farm buildings, each set consisting of house, barn and toilet, on the C. P. R. Colonies of Brooks, 24 sets; Acme, 8 sets; Carmangay, 19 sets, in Alberta and Wynyard, 18 sets, and Wolfe, 11 sets in Saskatchewan. Plans, specifications, etc., at office of James Hart, Supt. of Development Branch, Dept. of Natural Resources, Calgary, Alta., who will receive tenders till April 7.

Brandon, Man.
Sullivan & Considine Co., Chicago, Ill. Company contemplates erecting up-to-date vaudeville theatre in Brandon, at a cost of $100,000.

Burnaby, B.C.
Tenders received by Sec. School Bd., A. J. Barham, until April 12, for erection of 1-storey frame construction teacher's residence and a 2-room frame school building on Block 5 D. L. 127.

Dundas, Ont.
Improvements to house of refuge for County of Wentworth, planned. Supt., Henry Bates. Chairman of Commission, John Vance, Waterdown, Warden of County. (a) 450 ft. pipe and equipment required for extension of water service. (b) 3 hydrants to be installed (c) elec. lighting to be extended. (d) about 450 ft. lawn hose. (e) electric pumps to be installed in laundry. (f) 25 water bowls to be placed in barns.

Esterhazy, Sask.
Addition to school planned by Town Council. Architects, Reilly, Dawson, Hancock & Reilly, Regina. Tenders received by Sec.-treas., V. Flook, till April 5, for stone and brick. Plans, specifications, etc., at office of architects and Sec.-treasurer.

Fort William, Ont.
Sunday school, cost $40,000, for St. Andrews Presbyterian Congregation. Plans in progress.

Hull, Que.
Roman Catholic Church, cost $50,000, Wrightville, contemplated. Address Archbishop Gauthier, Hull, Que. Plans will be prepared.

Hampton, N.B.
Wooden lighthouse tower, near Shampers wharf, Kings County, N.B., Tenders received by A. Johnston, Deputy Minister of Marine & Fisheries, until April 28. Plans, specifications, etc., at this Dept., Ottawa, and post offices at Kingston, Hampton, Rothesay and Portland.

Huntingdon, B.C.
School, Chilliwack district, planned by Provincial Government, Dept. of Public Works. Two rooms. Plans, specifications, etc., at office of Engineer, J. E. Griffiths, Victoria. Tenders received by Minister, Hon. Thos. Taylor, Victoria, until April 16.

London, Ont.
Gymnasium and amusement hall, cost $15,000, contemplated by Provincial Government, Dept. of Public Works. Sec., H. F. McNaughton, Parliament Bldgs., Toronto. Dr. Robinson, head of the London Asylum for the Insane, will make application for the above buildings, to replace those destroyed by fire.

Macleod, Alta.
Public building planned by Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders will be called about June 1.

Montreal, Que.
Repairing fire stations, cost $17,000, contemplated by Board of Control. Architect, A. Chausse, City Hall. Money has been voted for repairs.

Newmarket, Ont.
Post office, cost $20,000. Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Site has been selected and plans will be prepared.

North Battleford, Sask.
Public Building. Dominion Government, Dept. of Public Works. Secretary R. C. Desrochers, Ottawa. Architects, Stephenson, Evans & Fillingham. Plans, specifications, etc., at office of J. E. Cyr, Supt. of Public Buildings, Winnipeg, W. T. Mollard, clerk of works, Regina, Architects, North Battleford, and Department, Ottawa. Tenders received by Secretary until April 14.

Ottawa, Ont.
Theatre, Rideau street, for F. W. Carling, Metropolitan Bldg. Architect, C. P. Meredith, 126 Sparks street, is preparing plans.

Addition to hall, cost $5,000, Slater, for Salvation Army, Gladstone avenue. Architect, Major Miller, S. A. Headquarters, 20 Albert street, Toronto. Solid brick construction, cement foundation, Plans in progress.

Point Grey, B.C.
Club house, cost $21,000, for the Jericho Country Club. Architects, Maclure & Fox, 744 Hastings street west, Vancouver, have prepared plans. 1½-storeys, frame construction. Work to be done by day labor.

Red Deer, Alta.
Post Office, cost $50,000. Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders will be called shortly.

Regina, Sask.
Y. M. C. A., cost $20,000, planned. Building to be erected on Scarth street as soon as weather conditions permit.

Palace, cost $50,000, for the Congregation of the Holy Rosary Church. Architects, Fortin & Buchanan, have prepared plans. To be erected on block 398.

St. Stephen, N.B.

Club house contemplated by Arthur Price, Calais, Maine, U.S.A. Building will be occupied by the Thistle Athletic Association. Reception rooms, bathrooms, bowling alley and gymnasium. Plans in progress.

Toronto, Ont.

Theatre, cost $5,500, Greenwood ave., for Pye & Brickenden, 657 Carlaw ave. Tenders received by architect, Len. Foulds, 21 Leader Lane. Brick foundation, structural steel and brick construction.

Vancouver, B.C.

Creche, cost $40,000, Haro street, for the Civic Associated Charities and Relief Committee. Architect, A. Williams, 837 Hastings street west. Two storeys and basement, 50 x 65. Architect has been instructed to prepare plans.

Bachelors Club Building, cost $20,000, Nelson street, for W. Able, c/o architects, Stuart & White, 837 Hastings St. W., by whom tenders will be received. Three storeys, frame and brick veneer construction.

Victoria, B.C.

Museum. Provincial Government, Dept. of Public Works. Minister, Hon. Thos. Taylor. Architect, F. M. Rattenbury, 621 Sayward Bldg. Four storeys, 100 x 200, structural steel, reinforced concrete and Haddington Island stone construction, slate roofing, heating plant. To be erected as addition to present building. Plans in progress.

Winnipeg, Man.

Public comfort station, Main and Portage ave., contemplated by Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave., will prepare plans at once.

Synagogue for the Congregation of Shaarley Zedek, c/o Architect, Chas. S. Bridgeman, 20 Canada Life Bldg. 69 x 83, cement foundation, brick construction, stone trimmings, tile and marble floors. Tenders called.

Board of Control has been instructed by Fire, Water, Light and Power Committee, to call for tenders for erection of No. 14 fire station at corner of Westminster avenue and Ruby street. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James avenue.

CONTRACTS AWARDED

Alexandria, Ont.

School extension, cost $7,500, planned by Public School Trustees, Alexandria, Ont. Architect, C. P. Meredith, 126 Sparks street, Ottawa. General contractor, Alex. Cameron. Cement foundation, solid brick, structural steel construction.

Avonmore, Ont.

School, cost $10,000, planned by Continuation School Trustees. Architect, C. P. Meredith, 126 Sparks street, Ottawa. General contractor, Gilbert Emard, Embrun, Ont. Cement foundation, solid brick, structural steel construction.

Hamilton, Ont.

Alterations to school, cost $4,000, McNab street, for Separate School Board. Chairman, James [illegible] [illegible] Chambers. Architect, L. A. Wardell, Bay and Hunter streets. General contractors, Nicholson & [illegible], [illegible] Catherine north.

Kincardine, Ont.

Armoury. Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, John Mills. Two storeys, 90 x 45, brick construction.

St. John, N.B.

Post office, cost $381,850, Prince William. Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, G. E. Fairweather, 84 Germain street. General contractors, Rhodes Curry Co., Ltd., Amherst, N.S. Work of preparing ground to excavate has been started. Four stys. 200 x 160, concrete foundation, artificial stone construction.

St. Thomas, Ont.

Isolation Hospital, cost $6,000, planned by Board of Health. Mayor, E. N. Price. Architect, John T. Findlay, 386 Talbot street. Masonry, George Ponsford, 66 Centre street. Carpentry, Ed. Reath, 56 Southwick. Painting, Ed. Dallyn. Heating, Ingram & Davey, Ltd., 468 Talbot street. Plumbing, E. B. Dixon, 275 Talbot street. Electric wiring, Ontario Electric Co. One storey, 18 x 24 x 30.

Saskatoon, Sask.

School, cost $122,187, Block 11, Plan G 48 Buena Vista, for Public School Board, District 13, 321 21st street east. Architect, Robert Blackwood, Building Commissioner. Secretary, Wm. P. Bate, Box 1406. General contractors, Shannon Bros. & Cassidy. 12 rooms.

St. John, N.B.

Post office, cost $381,850, Prince William. Dominion Government, Department of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, G. E. Fairweather, 84 Germain street. General contractors, Rhodes Curry Co., Ltd., Amherst, N.S. Excavation, Wm. J. Cain, 48 Brussels street. Four storeys, 200 x 160.

Extension to hall for Knights of Columbus, St. John Council No. 9371. Architect, H. Claire Mott, 13 Germain St. General contractors, B. Mooney & Sons, 112 Queen street. Carpenter, E. A. Farren, 234 City Road. Steel, St. John Iron Works, Sydney street. Galvanized iron, Jas. McDade, 51 Mill street. Painting, Jas. H. Pullen, 16 Horsefield street. Electrical Work, Maritime Electric Co., 5 Cobourg street.

Vancouver, B.C.

Forestry building, cost $22,000, Hastings Park. Board of Control. Clerk, Wm. McQueen. Architects, Stuart & White, 837 Hastings street west. General contractors, A. V. Alder & Co., 441 Seymour street. 80 x 190, framework of logs, 3 to 4 ft. thick by 28 ft. long, mezzanine floor. General contractors are receiving sub-tenders for plumbing, sheet metal, painting and glazing, shingles, lumber, cement, sashes and doors and electrical equipment.

Theatre, cost $500,000, Pender street [illegible] Barclay street. General contractor, Ed- [illegible] work, J. Coughlan & Sons, 142 Hastings street west. Four storeys, structural [illegible]

Winnipeg, Man.

College building for the Manitoba Medical College, Bannatyne and Emily streets. Architect, E. W. Crayston, 572 Ross avenue. General contractors, Blow Bros., 704 Furby street. 60 x 95.

Business Buildings and Industrial Plants

Anyox, B.C.

Hotel, office building and hospital, cost $75,000, for the Grandy Co. Architects, Breseman & Durfee, 2 Halse Block, Nanaimo, B.C. Plans are completed.

Bridgeburg, Ont.

Factory for the Picture Film Co., 158 Pearl street, Buffalo. President, S. G. Sherry, Chicago. Site has been purchased and plans prepared.

Calgary, Alta.

Grand Trunk Pacific Railway Company will erect large hotel opposite the new station at corner of 6th ave. and 5th street east.

Hamilton, Ont.

Stores and apartments, cost $7,000, Barton street east, for Miss K. Loosely, 132 Emerald street south. Architect, H. New, Spectator Bldg., has plans in preparation.

Three stores and apartments, cost $15,000, King and Dundurn streets, for T. W. Hand, 584 King street west. Architects, Armes & Scott, Federal Life Bldg., are preparing plans.

Montreal, Que.

Storage sheds, cost $5,000, Beaumont, Bordeau Ward, for General Fire Extinguisher Co., 175 McCord street. One sty., 100 x 75, concrete foundation, frame and galvanized iron construction, 4 ply gravel roofing. Plans in progress.

North Battleford, Sask.

Storage building, cost $10,000, George street, planned for the Western Canada Saw Mill Yards Co. 50 x 100 x 40 feet high. To be used to store high grades of lumber. Permit has been issued.

Ottawa, Ont.

Addition to factory, cost $15,000, for Dominion Wire Cloth Mfg. Co., Armstrong street. President, J. R. Buchanan, is preparing plans. Solid brick construction, cement foundation. Plans in progress.

Port Arthur, Ont.

Stores and offices, cost $65,000, Cumberland, for D. F. Burke. Three stys., 132 x 82½, up-to-date restaurant in basement, cement foundation, cut stone and pressed brick construction. Plans in progress.

Prince Albert, Sask.

Business block, cost $50,000, Central ave., contemplated by a syndicate. Interested, Bradshaw Agencies, 1028 1st ave., and Ald. J. S. Woodward. Five storeys. Plans in progress.

Prince Rupert, B.C.

Hotel, cost $1,000,000, for Grand Trunk Pacific Railway. Architect, F. M. Rattenbury, 621 Sayward Bldg., Victoria, B.C. Pressed brick exterior, stone [illegible]

Regina, Sask.

Warehouse, cost [illegible] erected on block [illegible] Plans in progress.

Business block, cost $35,000, Scarth street, [illegible] ceilings. To be ready for occupation by end of summer. Plans in progress.

St. Catharines, Ont.

Alterations and additions to stores and apartments, cost $10,000, St. Paul street, for Mrs. J. S. Campbell. Architect, T. H. Wiley, is preparing plans.

Toronto, Ont.

Mr. [illegible] Leader Lane is preparing plans for the erection of a bank for the Bank of Ottawa at the corner of Gerrard & Logan. Tenders will be open in a week's time.

Warehouse, Richmond street, planned for Robertson Bros., 103 Queen E. Architect, H. G. Salisbury, 17 Bowden ave. No tenders called. Owners will purchase material and supervise construction. Structural steel and brick construction.

Stores and apartments, cost $13,000, Dundas and St. Clarens, for Geo. Kerr, c/o architects, Symons & Rae, 15 Toronto street. Tenders received by architects. Three storeys, 99 x 32, brick foundation, structural steel and brick construction, felt and gravel roofing.

Alterations to store and hall, cost $8,000, Dundas, for Misses L. & E. Colvin, 1691 Dundas street. Architect, P. R. Wright, 332 Clendennan. Two storeys, structural steel and brick construction, stone foundation. Plans drawn.

Warehouse, cost $37,000, Dundas, for C. A. Ward, 300 College street. Structural engineers, James, Loudon & Hertzberger, 57 Adelaide street east. Five storeys, 47 x 130, cement foundation, structural steel and reinforced concrete. Tenders received by owner.

Factory, cost $40,000, Dundas, for Dearborne Chemical Co., Chicago, Ill. Architects, Van Holst & Fyfe, 907 Steinway Hall, Chicago. Two storeys, 100 x 111, cement foundation, structural steel and reinforced concrete construction. Plans drawn.

Vancouver, B.C.

Store for Woodward Department Stores Limited, Hasting and Abbott Sts. Architect, G. H. Weynon, New York, has prepared plans. Ten storeys, 152 x 132, to be erected on site of present bldg.

Warehouse and dock, Smythe street, planned for H. A. Forsyth & Co. Architect, T. H. Bamforth, 319 W. Pender street. Tenders will be called shortly for wharf, 225 feet long and one storey warehouse, train tracks through centre of building. Later dock and warehouse will be extended to 700 feet.

Victoria, B.C.

Business block, cost $250,000, Douglas and Broughton streets, for Weiler Bros. 921 Government street. Architect, A. A. Cox, 198 Hastings street west, Vancouver. Ten storeys, 120 x 120, structural steel construction. Plans prepared.

Windsor, Ont.

Factory will be erected for the Remington Arms Union Metallic Cartridge Co., New York. Work has been started on the main building, 122 x 60.

CONTRACTS AWARDED

Aylmer, Que.

Office, cost $5,000, Van Croft street. Owner and general contractor, George R. Nash, coal merchant. Cement foundation, solid brick construction.

Calgary, Alta.

Stores and offices, 7th ave. west. Architect and general contractor, Dr. T. H. Blow, 8th ave. west. Two storeys, 75 x 26, brick construction, cement foundation. Excavating started.

Hamilton, Ont.

Remodelling stores and apartments, cost $35,000, King street east, for A. Williamson and J. F. Torrance, Spectator Bldg. Architect, H. New, Spectator Bldg. Heating and plumbing, Adam Clark & Son, Main street west. Plasterer, E. Lane, 36 Leeming street.

South Edmonton, Alta.

Warehouse, cost $9,000, for W. H. Poucher, 4th street N. Edmonton. General contractor, O. J. Edinger, 42 Whyte ave. One storey, 32 x 60.

Toronto, Ont.

Warehouse, cost $4,000, Brock, for Jas. McQuillan, 1446 Queen west. Architect, J. Ingham, 22 Leopold street. Mason, Wm. C. Herod, 98 Dovercour road. One storey, 34 x 90, stone foundation, brick construction, concrete floors.

Factory, cost $3,500, Wellington St. Owner and builder, Edward Ramage, 29 St. Joseph street. One storey, 45 x 121, cement foundation, structural steel and brick construction.

Four stores, Gerrard and Logan. Architect and builder, C. A. Scott, 116 Simpson ave. Work done by day labor. Brick construction. Excavating done.

Warehouse, cost $14,000, Clifford. Owner and builder, F. R. Cowan, 202 Crawford street. Two storeys, 40 x 80, brick foundation, structural steel and brick construction.

Vancouver, B.C.

Office building, stores and laundry, cost $100,000, Drake street, for C. P. R. Gen. contractors, Westinghouse, Church Kerr & Co., 837 Hastings street west. For erecting combined office building, stores and laundry for the use of sleeping and dining car departments.

Addition to warehouse, cost $30,000, for the Can. Gen. Elec. Co., 1065 Pender street west. Architects, Honeyman & Curtis, 821 Pender St. W. General contractors, Purdy & Lonergan, 1340 Barklay street. Four storeys, 33 x 132, brick construction, galvanized iron cornices, roller and fireproof doors.

Vernon, B.C.

Stores and club rooms, cost $9,000, Barnard ave., for R. E. Berry. Architect, O. H. Hatchard. General contractor, T. E. Crowell. Two storeys, 50 x 100, cement foundation, frame construction, 120 ft. of tile floors, B. C. fir floors, metal ceilings, skylights, metal sash, store fronts and fixtures, etc. Contract not let yet for heating, plumbing and interior fittings.

Victoria, B.C.

Addition to Bank, cost $20,000, Government and Bastion street, for the Bank of Montreal. Architect, A. A. Cox, 198 Hastings street west, Vancouver. General contractors, the Westholme Lumber Co., Government and Pandora streets, Victoria. One storey, stone construction.

Residences

Twp. of Ancaster, Ont.

Two residences, cost $6,000, for Hugh & Philip, Tregunno, Bartonville. Architect, E. B. Patterson, 167½ King St. E., Hamilton. Brick and frame construction. Plans drawn.

East London, Ont.

Two residences, cost $6,000, Eleanor street, for Jones Bros., builders, Hamilton road and Maitland street. Two stys. white brick construction. Plans being prepared.

Kingston, Ont.

Apartment house, King and Gore Sts., contemplated by a local company. Further information may be had from J. S. R. McCann, Brock street. Three stys., site 100 x 100, 3 and 5 room suites. Plans will be prepared.

Lacombe, Alta.

D. Beaver and I. Clemens, Hespeler, Ont., will erect 25 residences at a summer resort near Lacombe, Alta. Frame construction, shingle roofing.

Lambeth, Ont.

Residence, cost $4,800, for Miss Moore, c/o Mrs. David Lown. Two storeys, pressed brick construction. Plans in progress.

London, Ont.

Residence, cost $5,000, Colborne, for H. G. Hasper, c/o R. C. Struthers & Co., Richmond street. Architect, W. G. Murray, 111 Masonic Temple, will receive tenders after April 1st. 2½ stys., red pressed brick construction, brick foundation.

Residence, cost $3,800, for Fred Hunter, 87 Askin street. Architect, W. G. Murray, 111 Masonic Temple. Two storeys, white brick construction. Plans in progress.

Montreal, Que.

Five flats, cost $9,000, Dumas, for Antonio Russo, Clovis and Orchard aves. Work will be done by day labor. Three storeys, 25 x 35; concrete foundation, 3-in. plank; frame and brick construction. Plans drawn.

Ottawa, Ont.

Apartments, cost $15,000, alterations and addition, Clarence, for J. Eagleson, Cooper street. Architect, J. P. MacLaren, 104 Sparks street. Tenders received by architect. Solid brick construction.

Apartments, cost $30,000, for A. G. Cole, 142 McLaren. 66 ft. frontage. Plans in progress.

Residence, cost $12,000, Marlboro, for Lt.-Col. F. Gourdeau, 27 Goulbourne, Ottawa. Architect, C. P. Meredith, 126 Sparks street. Stone foundation, solid brick construction. Plans in progress.

Port Arthur, Ont.

Residence, cost $5,500, for Alfred Friday, 61 Court street south. Architect not decided. 2½ storeys, 28 x 40, pressed brick veneer, cement foundation.

South London, Ont.

Bungalow, cost $4,200, Ridout street, for Walter Langley, 111 Marley Place. Architect, W. G. Murray, 111 Masonic Temple. To be built this spring. Stone and cement foundation. Plans in progress.

Toronto, Ont.

Apartment house cor. King and Dowling ave., for S. King, Plans prepared by Makepeace and McConnell, Kent Bldg. Tenders will be called.

Residence, cost $6,000, Belsize Drive, for A. H. Morine, Kent Bldg. Architect, W. F. Shepherd, 774 Shaw street. 2½ storeys, 30 x 39, structural steel and brick construction, brick foundation. Plans drawn.

Three pair residences, cost $15,000, Ossington, for Dr. Jas. W. Barton, 481 Palmerston. Architect, J. W. Abb, 207 Clinton street. 2½ storeys, 32 x 44, stone foundation, brick construction. Plans drawn.

One detached residence, cost $17,000, Lonsdale, for Alex H. Beaton, c/o Architects, Eden Smith & Son, 199 Yonge street. 2½ storeys, 44 x 70, brick construction and foundation. Plans drawn.

Residence, cost $4,000, Sherwood, for C. E. Pickard, 59 Lonsdale. Architect, W. H. Ratcliffe, 94 Leuty ave. 2½ stys., 22 x 46, brick construction, brick foundation. Plans drawn.

Vancouver, B.C.

Addition to rooming house for J. C. White, c/o architect, Wm. Frederick Gardiner, 347 Pender street west. Two storeys, 33 x 60, frame, concrete foundation. Tenders received by architect.

Victoria, B.C.

Apartment house, Linden ave. and Fairfield road, for Mr. A. McCrimmon, 629 Johnson street. Architect, L. R. Hazeltine, Room 3 McGregor Block. 4-storeys in front, 2 in rear, cement stucco faced. Plans prepared.

Westboro, Ont.

Residence, cost $5,000, for H. Living, Golden street. Brick veneer construction, stone foundation. Plans in progress.

Residence, cost $5,000, Cole ave., for Howard Cummings, Main street. Brick veneer construction, cement foundation. Plans in progress.

Wingham, Ont.

Residence, cost $5,200, for Father Blair, c/o Catholic Rectory. Architects, McBride & Fairfield, Edge Block, London. Two storeys, stone and cement foundation, white brick construction. Plans in progress.

Winnipeg, Man.

Residence, cost $15,000. Architect, F. R. Evans, 506 Somerset Bldg. 2½ stys., and basement, 40 x 40, stone foundation, stone trimmings and pressed brick construction. Plans drawn.

CONTRACTS AWARDED

Calgary, Alta.

Residence, cost $4,000, for A. I. Lott. Builder and general contractor, P. W. Allison, 637 5th ave. west. Two stys., 24 x 32, cement foundation, frame construction.

Two residences, cost $5,000, for E. T. Taylor, 1734 11th ave. west. General contractor, T. Keen, 1734 11th ave. west. Two storeys, 19 x 36, frame, cement foundation. Foundations in.

Edmonton, Alta.

Residence, cost $8,000, [illegible] street, for F. B. Mathews, Clara street. General contractor, T. Ramsay. Two storeys, 30 x 38, brick foundation, frame construction. Excavating done.

Residence, cost $3,500, Kennedy, for H. Heiss. General contractor, H. Buchholz, [illegible] street. Two storeys, [illegible] x 30, frame construction, cement, concrete foundation.

Residence, cost $4,000, Raymer. Architects and general contractors, [illegible]

& Wright, 641 Syndicate ave. Frame construction, cement, concrete foundation. Excavation started.

Halifax, N.S.

Two residences, cost $7,000, for H. S. Freeman, 15 Carleton street. General contractors, Freeman Bros., 13½ Carleton street.

Hamilton, Ont.

Seven residences, cost $14,000. Owner and general contractor, H. Dunham, 719 Cannon street east. Brick construction. Permit granted.

Residence, cost $4,500, Balmoral ave., for Delta Park Co. President, J. G. Gould, Canada Life Bldg. Builder, Myles Carver, 137 John street south. 2½ storeys, stone foundation, pressed brick construction.

Four residences, cost $8,000, Ferguson ave. Owner and general contractor, M. Levy, Lister Chambers, James street. Concrete foundation, brick construction.

London, Ont.

Residence, cost $4,200, Duchess ave., for Harry Lister, druggist, 136½ Wortley road. Architect, W. G. Murray, 111 Masonic Temple. General contractors, Copp & Brown, 31 Beaconsfield avenue, S. London. Two storeys, 30 x 45.

Ten residences, cost $25,000. Owner and builder, John Wilkey, 910 Lorne ave. 1½ storey, white brick construction.

Montreal, Que.

Residence, cost $7,000, Queen Mary Rd., for Joseph Hoyle, 1868 St. Urbain. Builder, Joseph Chaput, 757 Mt. Royal ave. east. Two storeys, 32 x 50, cut stone and solid brick construction, concrete foundation.

Bungalow, cost $9,000, for Finnie Millar Co., 815-817 New Birks Bldg., Montreal. Architect, G. A. Nosworthy, 814 New Birks Bldg., Montreal. One sty., 42 x 32.

Three flats, cost $4,000, St. Hubert. Owner and builder, M. Dubreuil, 3020 St. Hubert. Two storeys, 36 x 51, cement foundation, 3-in. plank, frame and brick construction, felt and gravel roofing.

Ottawa, Ont.

Residence, cost $6,500, James street. Owner and general contractor, Thomas Clarey, 111 Centre street. Two storeys, 40 x 35, double brick veneer construction, stone foundation. Excavating started.

South Edmonton, Alta.

Residence, cost $6,000, Fifth ave. N., General contractors, Payne & Conover, 251 Jasper ave. west. Architects, Van Sielen & Macomb, Alexander Block. 1 storey, 32 x 48, brick construction and [illegible]

Toronto, Ont.

Residence, cost $4,500 Theodore. Owner and builder, F. Campbell, 378 Dupont street. 2½ storeys, 24 x 31, brick construction, stone foundation.

Three detached residences, cost $9,000, Carey road. Owners and builders, Sharp Construction Co., 19 Adelaide street E. 2½ storeys, 22 x 40, brick construction, stone foundation.

Five pair residences, cost $22,500, Carlaw ave. Architect and builder, W. W. Hiltz, 682 Broadview ave. Mason, Jas. [illegible]

C. Cotes, 1 Dingwall ave. Foundations started.

One detached residence, cost $4,000, Rose Park Drive. Owner and builder, J. T. Littlefair, 46 St. Clair ave. 2½ storeys, 20 x 38, stone fndn., brick construction.

One detached residence, cost $5,000, High Park ave. Owner and builder, W. H. Weir, 161 Quebec ave. 2½ storeys, 24 x 38, stone foundation, structural steel and brick construction.

One detached residence, cost $3,500, Chelsea and Dorval. Owner and builder, H. S. Cooper, 33 Sinclair. Two storeys, 23 x 47, brick construction, stone foundation.

One pair residences, cost $6,500, Carlaw ave. Owner and builder, W. Hodgkinson, 663 Carlaw ave. 2½ storeys, 34 x 42, brick foundation, brick and roughcast construction.

Residence, cost $4,000, Northern ave. Owner and builder, W. J. Thompson, Bloor and Bathurst streets. 2½ storeys, 24 x 38, brick construction and foundation.

One detached residence, cost $3,000, for A. Saunders, 128 Balliol street. Builder, J. L. Davies, 149 Glenwood ave. 2½ storeys, 18 x 36, brick construction and foundation.

One detached residence, cost $4,000, Rosemount. Owner and builder, J. D. Naylor, 202 Oakmount road. 2½ stys., 24 x 32, stone foundation, brick construction.

Two detached residences, cost $6,000, Medland. Owner and builder, Geo. W. Johnston, 598 Crawford street. 2½ stys. 22 x 44, stone foundation, brick construction. Plans drawn.

One pair residences, cost $5,000, Pape ave. Architect and builder, F. L. Beecroft, 244 Carlton street. Work being done by day labor. Brick construction and foundation. Excavating started.

One detached residence, cost $6,000, Orchard Park Road. Owner and builder, Haindl Bros., 377 Danforth ave. 2½ storeys, 22 x 34, brick construction and foundation.

One detached residence, cost $5,000, 37 Alvin, for R. F. Charlton, 37 Foxbar. Builder, W. Brown, 122 Garnet ave. 2½ storeys, 24 x 42, stone foundation, brick construction.

Residence, cost $3,500, Davenport. Owner and builder, F. Sharp, 1425 Bloor West. 2½ storeys, 22 x 35, stone foundation, brick construction.

Verdun, Que.

Three flats, cost $4,000, Ethel, for M. St. Pierre, 220 Ethel street. Builder, Z. Sauve, 124 Church ave. Three storeys, 25 x 43, concrete foundation, 3-in. plank, frame and brick construction.

Vancouver, B.C.

[illegible] 11th ave. west, for M. M. Harrell, 207 Hastings street west. Architect, M. I. Taylor, 207 Hastings street west. General contractors, [illegible]

Victoria, B.C.

[illegible] for Dr. H. J. Wasson, 1147 Fort street. Architects, Mitton & Whitehead, 13 [illegible]

(Continued on page [illegible])

Tenders and For Sale Department

Tenders for Power House Equipment

[illegible] marked on the outside of the envelope "Tender for Power House Equipment," and addressed to the City Commissioners at Regina, Sask., will be received [illegible] April 30th for the supply of:

1 1200 kw. synchronous motor generator or motor converter set, complete with panel for the control of A.C. motor and generator panel, and equalizing pedestal for the control of [illegible].

Specifications may be had upon application to Mr. E. W. Bull, Superintendent of Light and [illegible].

A marked cheque for five (5 p.c.) per cent. of the amount of bid must accompany each tender.

The City Commissioners reserve the right to reject any or all tenders.

E. W. BULL,
11-15 Superintendent of Light and Power.

CITY OF REGINA

Waterworks Department

Sealed tenders will be received by the City Commissioners up till noon, 12 o'clock, **April 9th, 1913**, for the supply and delivery F.O.B. cars, Regina, of the following—

Contract B

[illegible]

77637 lin. ft. of 6-in cast iron pipe.
7180 lin. ft. of 8-in. cast iron pipe.
2983 lin. ft. of 10-in. cast iron pipe.
1140 lin. ft. of 12-in. cast iron pipe.
9958 lin. ft. of 16-in. cast iron pipe.
10941 lin. ft. of 18-in. cast iron pipe.
16712 lin. ft. of 24-in. cast iron pipe.
96.02 tons Specials.

Contract C

105 tons ¾-inch lead pipe.
25 tons 1-inch lead pipe.
4500 lin. ft. 2-in. galvanized pipe and couplings.
500 lin. ft. ¾-in. galv. pipe and couplings.
[illegible] lin. ft. 1-inch black pipe.
123½ tons pig lead.
5 tons braided jute rope.

Contract D

150 2-in. brass gate valves.
271 6-inch iron body gate valves.
29 8-inch iron body gate valves.
4 10-inch iron body gate valves.
2 12-inch iron body gate valves.
15 16-inch iron body gate valves.
13 18-inch iron body gate valves.
13 24-inch iron body gate valves.
1 18-inch check valve.
[illegible]
190 6-inch fire hydrants.
10 8-inch fire hydrants.

Contract E

1750 ¾-inch Corporation Cocks.
800 1-inch Corporation Cocks.
1750 ¾-inch Curb Cocks.
800 1-inch Curb Cocks.
300 ¾-inch lead to lead unions.
200 1-inch lead to lead unions.
150 1-inch four-way branches..
1500 No. 2 curb boxes.
200 No. 4 curb boxes.
200 curb box tops.

Specifications and other information may be obtained at the office of the undersigned.

A marked cheque for five per cent. of the bid must accompany each tender.

Lowest or any tender not necessarily accepted.

J. M. MACKAY,
12-14 Supt. of Waterworks.

CITY OF VERNON, B. C.

Tenders for 500 B.H.P. Diesel Engine and 375 Kw. Generator

Tenders will be received up to 3 p.m., **April 11th, 1913**, by D. G. Tate, City Clerk, Vernon, B.C., for the following equipment:

Supply and installation of one 500 B.H.P. Diesel Engine.

Supply and installation of one 375 kw. 2300 volt, three phase, sixty cycle, generator with direct connected exciter.

Supply of one ten-ton travelling crane.

Specifications may be seen after March 20th, at the City Hall, Vernon, B.C., the offices of the Electrical News, and Canadian Engineer, Toronto; the Contract Record, Winnipeg; and the Consulting Engineers, Vancouver.

MATHER, YUILL & COMPANY, LTD.,
Consulting Engineers,
12-14 Vancouver, B.C.

City of Saskatoon

Material and Labor re Sewer and Water Extensions 1913

Sealed tenders, addressed to the City Commissioners and endorsed as per contents of each contract, will be received until 12 o'clock noon, **Tuesday, April 15th, 1913.**

Instructions to bidders, specifications and form of tender can be had on application to George T. Clark, City Engineer.

A deposit of $30 will be required for plans and specifications for labor on sewer and water extensions.

Contract No. 132.
Furnishing and delivery:—
130 Gate Valves, ranging in size from 6 in. to 24 in.

Contract No. 133.
Furnishing and delivery:—
75 Fire Hydrants.

Contract No. 134.
Furnishing and delivery:—
250 Manhole Frames and Covers.
51 Catch Basin Frames and Covers.

Contract No. 135.
Labor on Sewer and Water Extensions.

The Corporation reserves the right to let this contract in five sections. The approximate quantities are 9 miles of sewer and 9½ miles of water mains, and all the necessary manholes, valves and hydrants.

Contract No. 136.
Furnishing and delivery of approximately 10 miles of cast iron water mains and necessary specials, ranging in sizes from 4 to 24 in.

Contract No. 137.
Furnishing and delivery of approximately 101,000 feet of sewer pipe and the necessary specials, ranging in sizes from 5 in. to 24 in.

F. E. HARRISON, Mayor,
Chairman of Commissioners.
Saskatoon, March 13, 1913. 13-15

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
C **1515 Rockefeller Bldg., Cleveland, O.**

BRIDGE TENDERS

Sealed tenders will be received up to Saturday, **April 5th**, for the construction of the following:—

(1) 157 foot steel bridge with concrete floor, at Glenallen for the County of Wellington.

(2) 80 ft. reinforced concrete arch bridge near Moorefield for the Township of Maryboro'.

Tenders for steel bridge are to be sent to C. G. Stickney, Windfield, and for the arch, to R. McArthur, Moorefield; or tenders may be handed in at the letting at Drayton on Monday, April 7th at 2 p.m.

For plans and other information apply to

BOWMAN & CONNOR,
13-14 36 Toronto St., Toronto, Ont.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Concrete Revetment Wall at Burlington, Ont.," will be received at this office until 4 p.m., on **Monday, April 31, 1913**, for the construction of a concrete revetment wall along the shore front of Lake Ontario, at the Village of Burlington, in the Township of Nelson, County of Halton, Province of Ontario.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Bldg., Toronto, Ont.; H. J. Lamb, Esq., District Engineer, Windsor, Ont., and on application to the Postmaster at Burlington, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 20, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—37679. 13-14

EXTENSION OF TIME

Notice is hereby given that the time for the reception of tenders for the construction of the Ottawa Customs Building is extended to **Tuesday, April 15, 1913.**

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 26, 1913. 14

Wanted to Purchase

1 30-ton Steam Shovel.
10 Standard gauge 6 or 9 yard Dump Cars.
1 Standard Gauge Locomotive, about 25 tons.
1 Bucket Elevator, capacity 100 cu. yds per hour.

National Sand and Material Co., Ltd.,
14-15 Welland, Ont.

CITY OF FORT WILLIAM

Tenders For

Water Mains, etc.

Alternative bids are invited for cast iron and steel pipes and specials for 18-inch water main.

Sealed tenders, addressed to the City Clerk, endorsed "Tender for Water Main," will be received up to 5 o'clock p.m. of **Thursday, April 17th, 1913.**

Forms of tender can be obtained from the undersigned upon application.

The lowest or any tender not necessarily accepted.

RAY R. KNIGHT,
City Engineer.
March 26, 1913. 14-15

Town of North Battleford
Province of Saskatchewan

Water Works, Sewerage Works and Concrete Sidewalks

Sealed tenders will be received by the Secretary-treasurer of the Town of North Battleford, until 8 p.m., **Tuesday, April 15th, 1913**, for the following works:

Contract A.--Pipelaying on Waterworks and Sewers.

Contract B. [illegible] Water Pipes and Specials.

Contract E.--Fire Hydrants and Gate Valves.

Contract S. Furnishing Vitrified Tile Sewer Pipe and Junctions.

Contract T.- Constructing Concrete Sidewalks and Curbs.

Plans and specifications may be seen at the office of the Engineers, Toronto and Winnipeg, and at the Town Hall, North Battleford, on and after March 17th, 1913.

[illegible] accepted.

D. S. WALKER, Esq., Mayor,
North Battleford, Sask.

H. W. DIXON, Esq., Secretary-treas.,
North Battleford, Sask.

CHIPMAN & POWER [illegible]
14 [illegible] Winnipeg

Tenders for Debentures

Sealed tenders, addressed to the undersigned, will be received up to 5 p.m. on **Monday, the 14th day of March, 1913**, for the sale of $11,901.80, Local Improvement Debentures of the Town of Petrolia, Ont., bearing interest at 5 per cent. and payable in 15 equal annual instalments of principal and interest.

The highest or any tender not necessarily accepted.

J. McHATTIE, Town Clerk.
Petrolia, March 27th, 1913. 14-15

Tenders for Portland Cement

The Corporation of the Town of Galt are prepared to receive tenders for the Portland Cement required during the season of 1913. The quantity is estimated at 1,000 barrels, more or less, and to be delivered in car load quantities, f.o.b. Galt, Ontario.

Tenders to be addressed to the undersigned and in his hands not later than Wednesday, April 16th, 1913.

The lowest or any tender need not necessarily be accepted.

JOSEPH McCARTNEY,
14 Town Clerk.

TENDERS

Tenders addressed to the undersigned at Ottawa and marked on the envelope "Tender for Mixed Paints," will be received up to noon of **the 21st day of April, 1913**, for supplying mixed paints manufactured and put up in accordance with the specification prepared by the Department of Marine and Fisheries to the satisfaction of the Inspector of the Department.

Tenderers will quote for the different lines of paints delivered at the following places, put up in one and half gallon cans, viz.:—Charlottetown, P.E.I., St. John, N.B., Halifax, N.S., Quebec, P.Q., Montreal, P.Q., Prescott, Ont., Parry Sound, Ont., and Victoria, B.C.

The approximate quantities required are as follows:—

Lighthouse white	5,000 gallons.
Roof red	2,600
Buoy black	1,600
Lantern red	1,800

All quotations must be for Imperial gallons delivered free on board cars at destination.

Tenderers may quote for paint delivered at one or all the places mentioned but the Department reserves the right to accept the whole or any part of the tender.

Specifications can be seen at the Agencies of this Department at Charlottetown, P.E.I., Halifax, N.S., St. John, N.B., Quebec, P.Q., Montreal, P.Q., and Victoria, B.C.

[illegible] tion from the Department of Marine and Fisheries at Ottawa and from the Agent of that Department in Victoria, B.C.

[illegible] contract prepared by the Department or fails to deliver the paint ordered in accordance with the [illegible]

Newspapers copying this advertisement without [illegible] paid.

ALEX. JOHNSTON,
[illegible]
[illegible]
[illegible] Ottawa, March [illegible] 191[illegible] 14-15

City of Port Arthur

NOTICE

Sealed tenders, endorsed on the envelope "Tenders for Sewer and Waterworks Material," will be received by the undersigned up to 5 o'clock p.m. of **Monday, April 14th, 1913**, for the supply and delivery of a quantity of material for Sewer and Waterworks Department, delivered at City Store House, Port Arthur, via boat and rail, list of material required may be obtained from the undersigned, or Contract Record and Engineering Review, Toronto, Ont.

A marked cheque for 10 per cent. of the estimated amount of the contract must accompany each tender.

The lowest or any tender not necessarily accepted.

J. J. HACKNEY,
Commissioner Utilities.
Corporation Offices, Port Arthur,
March 5th, 1913. 14-15

TOWN OF SANDWICH, ONT

Sealed tenders addressed to E. R. North, Town Clerk, Sandwich, and endorsed "Tenders for Sewers," will be received up to 12 o'clock noon on **Monday, the 7th day of April, A.D. 1913**, for the labor and material required in the construction of sewers on Soper, Marion and other streets in the Town of Sandwich, Ontario.

Plans, specifications and all information can be seen at the office of Owen McKay, Civil Engineer, Walkerville, Ontario.

Each tender must be accompanied by a certified cheque on a chartered bank, payable to the Treasurer of the Town of Sandwich, for the sum of two thousand ($2,000) dollars, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so. If the tender be not accepted the cheque will be returned.

The lowest or any tender not necessarily accepted. The names of two responsible persons willing to act as sureties must accompany each tender.

(Signed) E. R. North,
Town Clerk,
Sandwich, Ont.
Sandwich, March 27th, 1913. 14

Corporation of the City of Westmount

City Engineer's Department

Tenders are invited for the construction of following works:—

Contract No. 12 [illegible]
Contract No. 14 [illegible]
Contract No. 15 Paving of Churchill Ave
Contract No. 16 Paving of Clarke Ave
Contract No. 17 Sewer in Hudson Ave

[illegible] tract numbers are to be deposited with the Secretary-Treasurer, City Hall, Westmount, not later than twelve noon, April 10th, [illegible]

[illegible]

[illegible]
14 [illegible]

CITY OF LONDON, ONT.

[illegible] May 1st, 1913 [illegible]

[illegible] tons of special castings for the above.

[illegible]

64,000 lbs. lead pipe, and

[illegible]

For specifications and form of tenders, address H. J. Gaubitz, General Manager, Board [illegible] 14-15

Tenders Wanted

Public School Board Edmonton

Sealed tenders will be received by the undersigned up to **Thursday, April 17th, 1913**, for the erection of a seventeen class room brick school in Westmount Subdivision, Edmonton, Alta.

Tenders must be accompanied by a certified cheque for five per cent. of tender.

Plans and specifications may be obtained at the Public School Board, Edmonton.

The lowest or any tender not necessarily accepted.

Edmonton Public School Board,
Edmonton, Alta.
14-15

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Acton, Ont.," will be received until 4 p.m., on **Wednesday, April 30, 1913**, for the construction of a Public Building at Acton, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained on application to the Postmaster at Acton, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station F., Yonge street, Toronto, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be [illegible]

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a [illegible]tract when called upon to do so, or fail to [illegible]e the work contracted for. If the tender [illegible] accepted the cheque will be returned.

The Department does not bind itself to accept [illegible]

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 29, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the [illegible] 14-15

TENDERS

Sealed tenders addressed to the Secretary, Department of Indian Affairs, Ottawa, will be received up to noon, **Saturday, May 3, 1913**, for the construction of a steel highway bridge over Conger Creek in the Maniwaki Indian Reserve, County of Wright, Quebec.

Detailed information will be furnished on application to the said Secretary of the Department of Indian Affairs.

The lowest or any tender will not necessarily be accepted.

The unauthorized insertion of this advertisement in any newspaper will not be paid for.

J. D. McLEAN,
Asst. Deputy and Secretary.

Department of Indian Affairs.
—38623. Ottawa, March 18, 1913. 14-16

To Engineers and Architects

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." **It is the logical place to look for tenders called, and where most important works are advertised.**

Send along your plans when asking for tenders put a line in your advertisement to that effect. No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Port Burwell, Ontario," will be received until 4 p.m., on **Tuesday, April 22, 1913**, for dredging required at Port Burwell, Ontario.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for.

Contractors must be ready to begin work immediately on the opening of navigation.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, for fifteen hundred dollars ($1,500), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 29, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—38872. 14-15

TENDERS FOR

Public Lavatory and Stores on Dundas Street, Toronto

Bulk tenders, or tenders for the several trades mentioned below, in connection with the above building, will be received by registered post only, addressed to the undersigned up to noon on

Tuesday, 15th April, 1913

1. Mason; 2, Carpenter; 3. Plumbing, Heating, Electric Wiring, etc.; 4. Roofing; 5. Plastering; 6. Painting.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents. The usual conditions relating to tendering, as prescribed by City By-laws, must be strictly complied with or tenders may not be entertained. Tenderers shall submit with their tenders the names of two personal sureties or the bond of a guarantee company, approved by the City Treasurer.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman of the Board of Control.

City Hall, Toronto,
March 29th, 1913. 14

Board of Education

CITY OF TORONTO

Sealed tenders, whole or separate, addressed to the Secretary-Treasurer of the Board, will be received until

Friday Noon, April 11th, 1913

for the several trades required in the erection of

New Building at Carlton School

(Cor. Davenport Rd. and Osler Ave.)
and for

School Furniture

including

Pupils' Desks Teachers' Desks Tables and Chairs, Folding Chairs Kindergarten Tables and Chairs

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender, or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall, not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender not necessarily accepted.

W. O. McTAGGART,
Chairman of Committee.
W. C. WILKINSON,
Secretary-Treasurer.
14

Tenders For Construction of Sewer

Sealed tenders, plainly marked as to contents, will be received at the office of the undersigned, up to noon of **Monday, April 7th, 1913**, for the construction of a Sewer on Frederica street in the Township of York.

Plans and specifications and all information may be obtained at the office of Frank Barber, C.E., 57 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Township Engineer.
Toronto, March 31, 1913. 14

TENDERS FOR Laying and Jointing of Water Pipes, etc.

Tenders will be received by registered post only, addressed to the Chairman of the Board Control, City Hall, Toronto, Canada, up to noon on **Tuesday, April 15th, 1913**, for the laying and jointing of Water Pipes, Valves, Hydrants and Special Castings.

Specification and tender form for the foregoing may be obtained upon application at the office of the Waterworks Section, Department of Works, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents. The usual conditions relating to tendering, as prescribed by City By-law, must be strictly complied with, or the tenders may be declared informal. Tenderers shall submit with their tenders the names of two personal securities, approved by the City Treasurer, or, in lieu thereof, the bond of a guarantee company, approved as aforesaid.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
City Hall, Toronto,
March 26th, 1913. 14

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-14

FOR SALE

Dredge and Derrick and Tug, Portable Crusher, and 20 [illegible] Case Roller, "steam steerer," 19 Dump Waggons, Wheel and Drag Scrapers, Shovels, Hammers and Picks. All in good working order and cheap. Apply to H. A. Camjaigne, Niagara House, Niagara Falls, Ont. 10-14

FOR SALE

Koehring Concrete Paving Mixer, capacity 14 cu. ft.; used three months, in perfect condition.

20 H.P. Case Traction Engine with contractors fuel bunkers, in perfect condition; used two months.

Three rock drills, good condition. Apply Box 761, Contract Record, Toronto, Ont. 14-16

DO YOU NEED HELP?

If so let us know. We can furnish any amount of skilled and unskilled labor at shortest notice.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
Phone Adelaide 3019 14-17

Situations Wanted

WANTED—A [illegible] intendent with wide experience on sewer or waterworks. Work in West preferred. Box 759, Contract Record, Toronto, Ont. 14-15

Situations Vacant

WANTED—First class construction foreman, capable of handling reinforced concrete, stone and brick buildings. Carpenter by trade preferred. Navin Bros., Contractors, Moose Jaw, Sask. 14-15

Residences

(Continued from page 75)

Smith & Adams. Plumbing, Millar & Co., 920 Pandora ave. Plastering, G. Moffat. Painting, White & Jones.

Winnipeg, Man.

Two residences, cost $5,600, Athol ave. Architect and general contractor, L. Pullmer, 661 Selkirk ave. Two stys., 24 x 26, stone foundation, frame construction. Excavating started.

Residence, cost $5,500, Anderson ave., for Dr. W. Turnbull, 403 Bon Accord Bldg. Architect and general contractor, Alex. Black, 66 Cobourg ave. 2½ stys., 30 x 40, brick construction, stone foundation.

Power Plants, Electricity and Telephones

Aylmer, Que.

The Town is contemplating installing a complete electric lighting system, cost $30,000. Address Mayor for further information.

Kamloops, B.C.

Power station building planned by City Council. Clerk, J. J. Carment. Consulting engineers, Du Cane, Dutcher & Co., 911 Rogers Bldg., Vancouver. General contractors, Johnson & Co. 1-storey, 35 x 90, reinforced concrete construction.

Merlin, Ont.

Contemplated [illegible] equipment by Village Council and Twp. of Tilbury East. Clerk of Twp., Alex. [illegible] are to be secured for equipping a new electric power plant for the town.

Moose Jaw, Sask.

[illegible] quired by City Commissioners. A. W. Mayberry, L. W. Rundlett, W. F. Heal. [illegible] inson, Rugby, England. For furnishing [illegible] or.

Ottawa, Ont.

Street lighting, drainage, etc., planned by Town of Eastview. Mayor, C. [illegible]

[illegible] Dept. Engineer, Supt. J. E. Brown, City Hall. [illegible] lows for, Grimshaw, tape, solder, motor, incandescent lamps, Garrioch Godard & Co., 11 Elgin street; copper wire, split carbons, arc lamps, globes, transformers, Can. Gen. Elec. Co., 23 Sparks street; insulators, top-pins, Northern Electric & Mfg. Co., Ltd., 112 Bay street, Toronto; meters, Ferranti Electrical Co. of Canada, Ltd., 90 Sherbourne street, Toronto, $1,037.28.

Victoria, B.C.

Telephone equipment. Prov. Govt., Dept. of Lands, Forest Branch. Tenders received by Chief Forester, H. R. McMillan, until noon, April 14, for the following described material: 300 miles No. 9 BB. BWG galv. iron wire; 10 miles No. 12 EBB. BWG galv. iron wire; 18,000 No. 37 Thomas split tree insulators, or equal; 4,125 12 oz. "Brookfield" No. 32 double petticoat pony glass insulators, or equal; 4,125 1½ oz. 2-in. x 12-in. painted oak brackets conforming to A. T. & T. Co.'s specifications; 25 coils, 200 ft. per coil, No. 18 galv. seizing strand; 30 standard ground-rods; 15 telephones, wall set of type 1317-S Western Electric or equal; 15 telephones, look-out, of type 1336 J. Western Electric, or equal; 10 telephones, type Western Elec., U. S. Forest Service Portable, or equal, equipped with ground-rod; 20 pr. 16½-in. climbers of type No. 382, Klein's, or equal, complete with straps; 20 pr. 8-in. pliers of type No. 312 C Klein's, or equal; 20 pr. splicing clamps of type No. 311 A, Klein's or equal 20 haven clamps of type No. 368, Klein's or equal 20 lineman's block of type No. 480, Klein's, equipped with straps, or equal 10 Turner gasoline pocket-torch of type No. 6, T. Klein's or equal. Specifications at office of Department, Victoria.

Waneta, B.C.

The Waneta Development Co. will erect hydro-electric plant near Waneta at the Junction of the Salmon and Pend d'Oreille Rivers, at a cost of $75,000.

Winnipeg, Man.

Tenders received by Secretary of Board of Control, M. Peterson, until May 15, 1913, for two 3-phase generators 5000 kv.a., 60 cycle, 6600 volt, for power house at Point du Bois. Specifications at office of Engineer, J. G. Glassco, 54 King street.

Miscellaneous

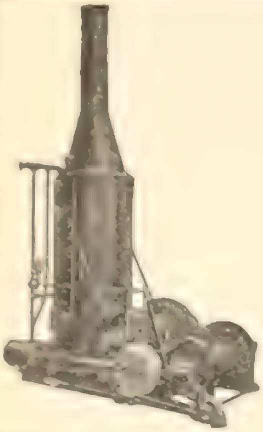
Ottawa, Ont.

[illegible] to (1) Barber Asphalt Co. for Trinidad Pitch Lake asphalt at $27.80 per ton; (2) Warren Bituminous Co. for Acme California asphalt at $24 per ton. Acting City Engineer, F. C. Askwith.

Vitrified clay pipe required. Mayor, J. A. Ellis. Acting City Engineer, F. C. Askwith, City Hall. Specifications at City Engineer's Department and at office of MacLean Daily Reports, Toronto. Prices and samples should be sent to engineer.

Regina, Sask.

[illegible] ers till April 21, 1913, for supply of 1 motor pumping engine and hose waggon; 1 motor chemical engine; 1 chief [illegible] A. W. Pool.



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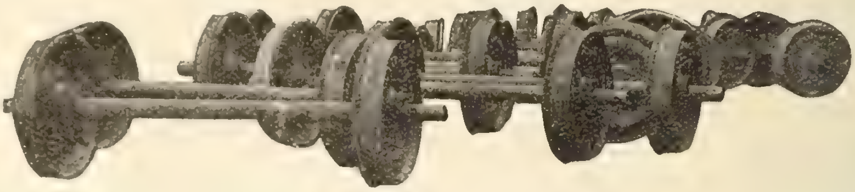

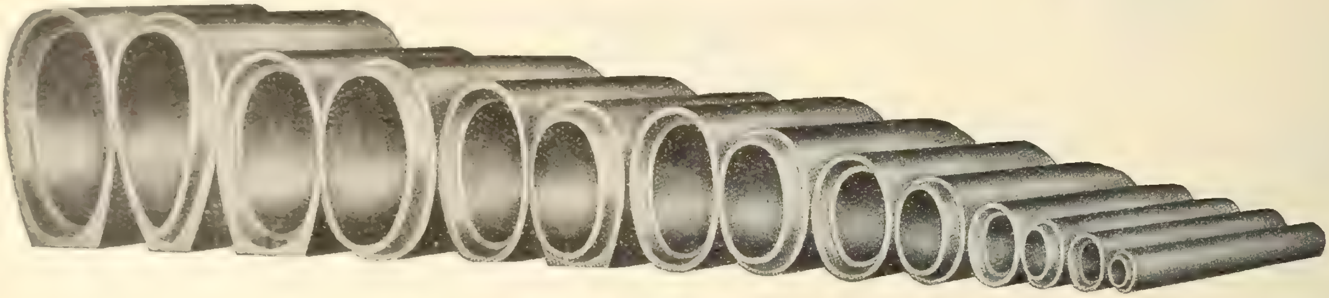

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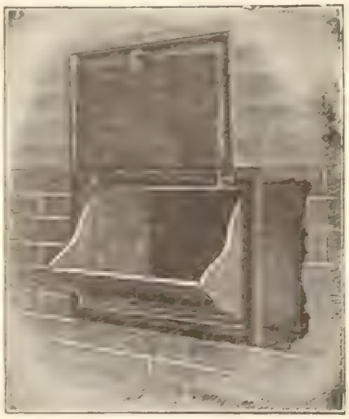

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with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

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Gates "K" Crusher, shown in the illustration, is built with high arched spider, offering a free opening and preventing any bridging of the rock, when dumped into the machine. Each opening is 42 inches by 8 feet and will receive a slab 3 ft. x 5 ft. x 10 ft. For detailed drawings of modern rock crushing plants.

See Bulletin 1411

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Nova Scotia Steel & Coal Company, Ltd.

Begs To Announce

That their new steam-hydraulic forge shop is now in operation, as also is their recently installed "Harmet" fluid compression-plant.

These improvements bring "Scotia's" equipment abreast of the best foreign forges.

They are accordingly open to supply forgings of all shapes and sizes. Made of ordinary or fluid compressed open-hearth steel, and satisfying the most severe specifications.

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The New McKiernan-Terry Class A-C Self-Rotating Combination

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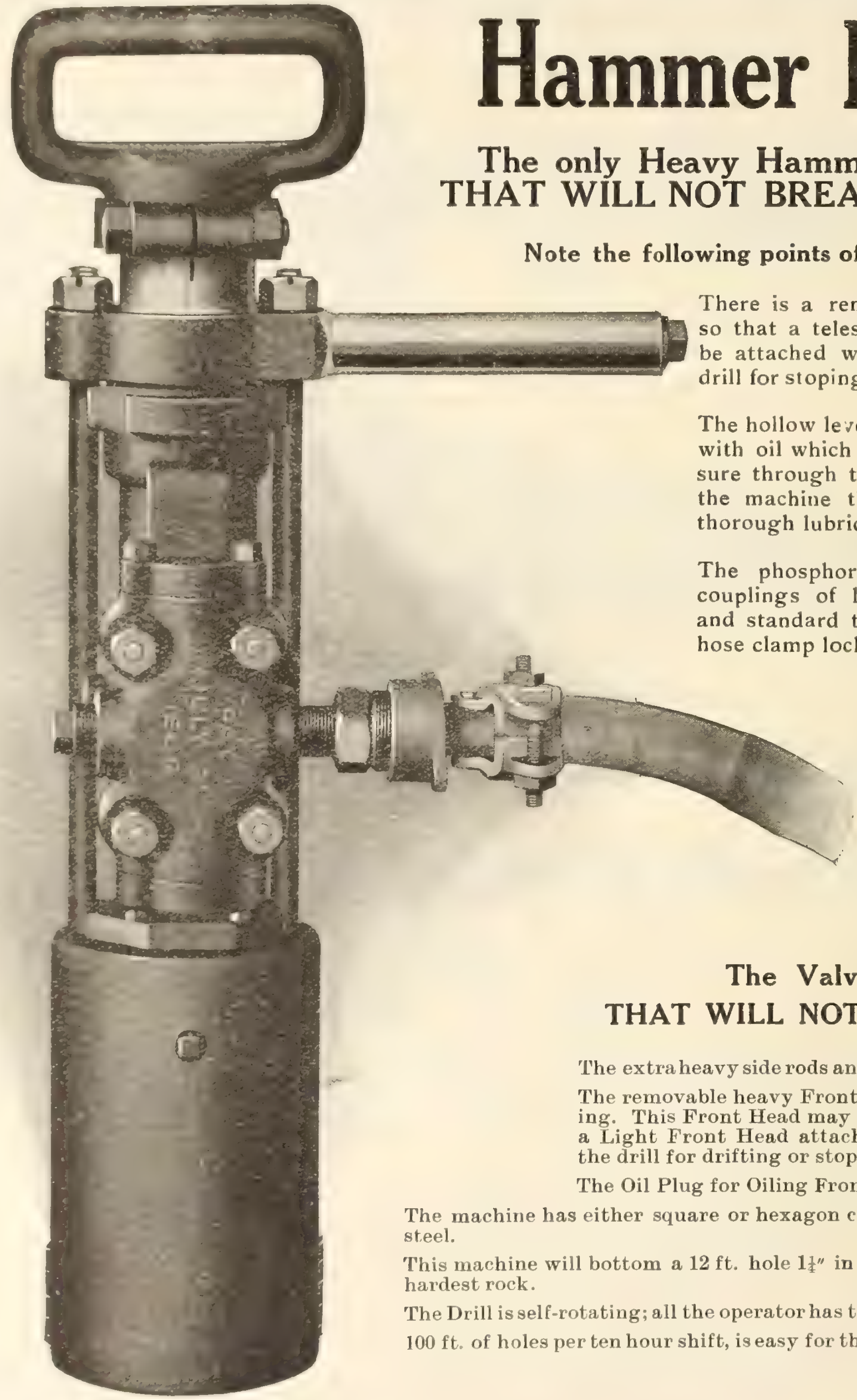

The only Heavy Hammer Drill THAT WILL NOT BREAK STEEL

Note the following points of interest:—

There is a removable handle so that a telescope feed may be attached when using the drill for stoping.

The hollow lever handle, filled with oil which is fed by pressure through the top head or the machine thus furnishing thorough lubrication.

The phosphor bronze hose couplings of large diameter and standard threads, with a hose clamp locked on.

The Valve THAT WILL NOT FREEZE

The extra heavy side rods and side rod spring

The removable heavy Front Head, for sinking. This Front Head may be removed and a Light Front Head attached when using the drill for drifting or stoping.

The Oil Plug for Oiling Front Head.

The machine has either square or hexagon chuck for hollow steel.

This machine will bottom a 12 ft. hole 1¼″ in diameter in the hardest rock.

The Drill is self-rotating; all the operator has to do is to hold it.

100 ft. of holes per ten hour shift, is easy for this this machine.

For further information and price, write the

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Wrought Iron Door Grills

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Push Plates

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The New Skylight
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attached like an ordinary sheet of corrugated iron no soldering nor flashing. Moveable or stationary sash, plain or wired glass. Made for corrugated iron or any other form of roofing.

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8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

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1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

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When for foundations and walls our architects are using more and more of that most enduring material, Concrete, why should anything less lasting be used for that most exposed part of the building? In

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"It is permanent because it is concrete"

Dolarway is the Permanent Way

The foolish man in the parable built his house upon the sand, just as some modern engineers now build their highways on loose broken stone.

The wise man built his house on solid rock—and the wise modern engineer establishes his roads everlastingly on monolithic concrete.

The most economical way to build roadways on concrete is the "DOLARWAY."

Dolarway Pavement consists simply of five inches of good rich concrete tamped to a smooth contour and protected from traffic and the elements by a coat of Dolarway Bitumen and sand.

A Dolarway Pavement costs ***much less*** than other permanent pavements. The saving in first cost of Dolarway Pavement if placed at interest, would provide a perpetual sinking fund more than sufficient for future maintenance.

Your pavement appropriation goes farthest when you specify Dolarway.

Full particulars and copy of booklet "The Story of Dolarway," free on request.

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The street was paved, partly with Asphalt of standard construction and partly with Creosoted Wood Block.

The Asphalt was taken up some time ago and street newly paved.

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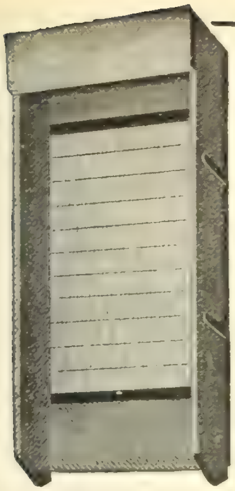

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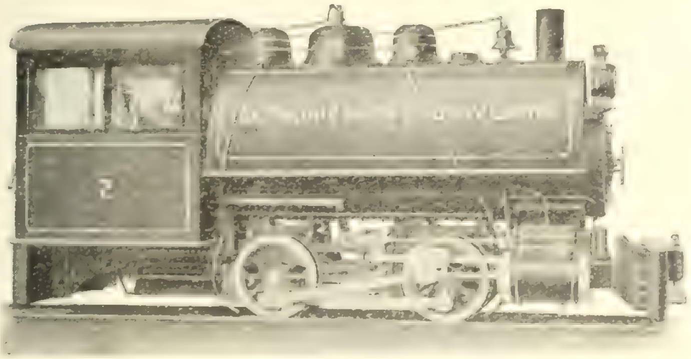

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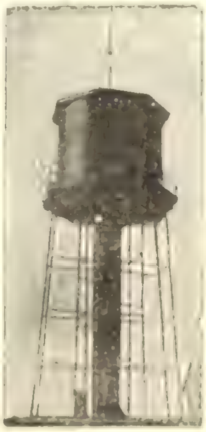

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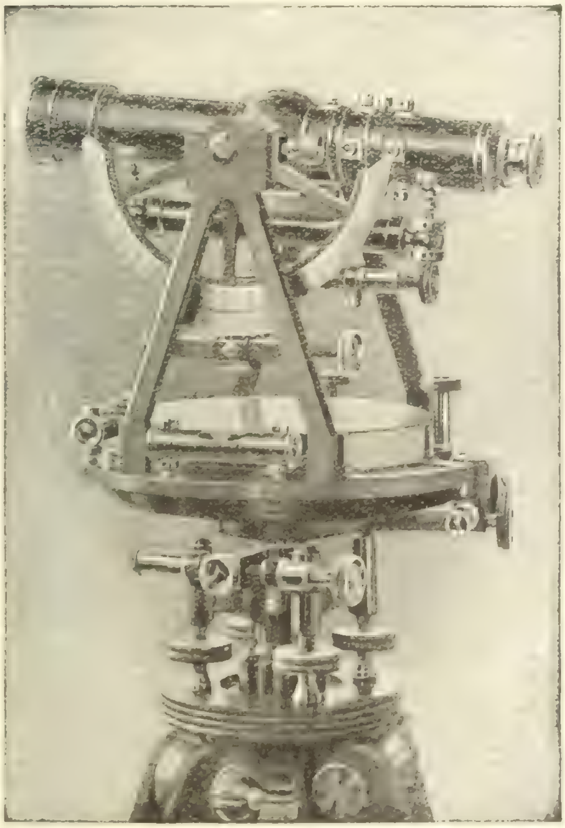

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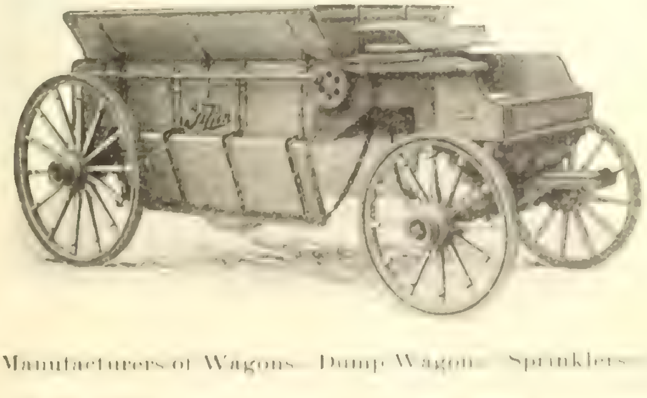

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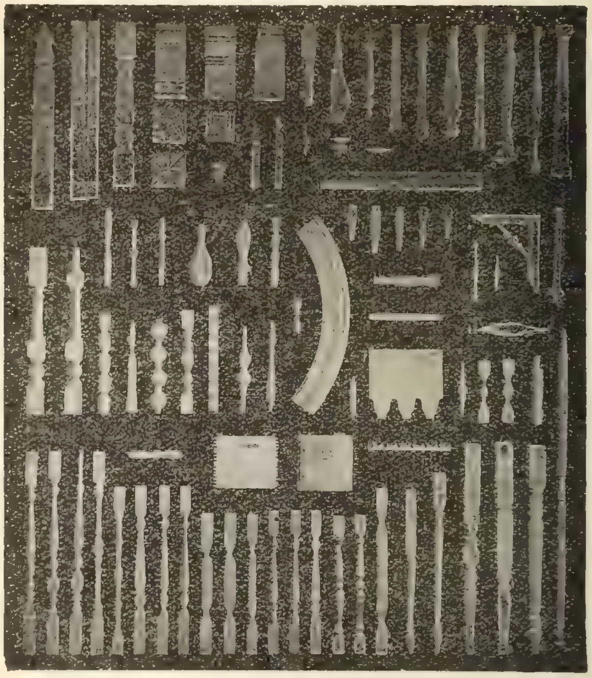

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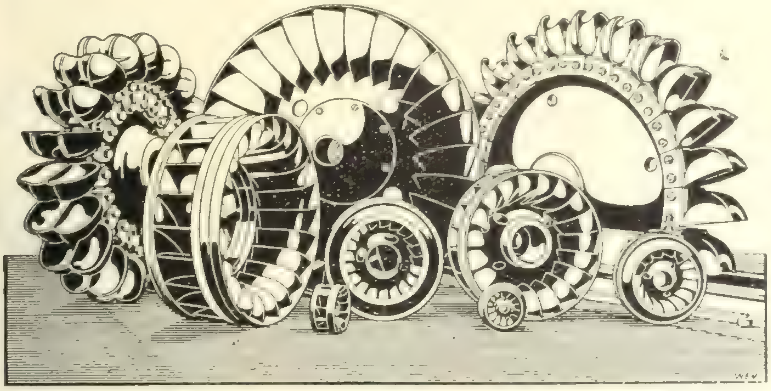

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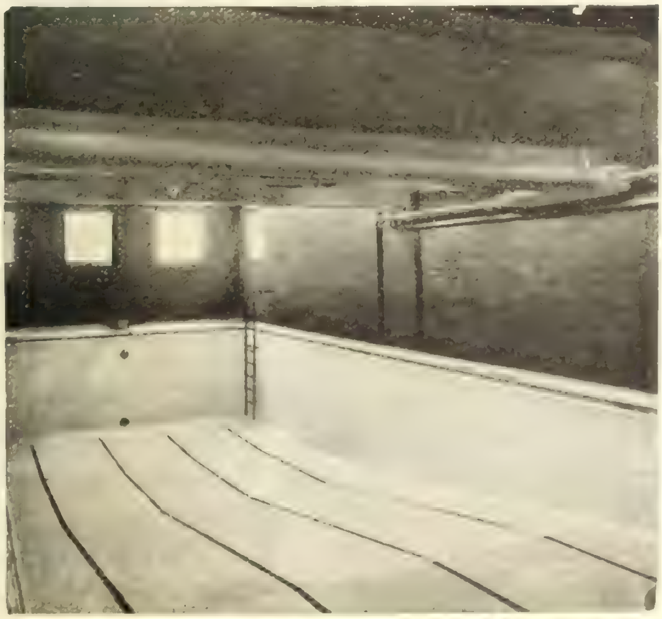

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CERESIT was the only Waterproofing that proved satisfactory

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DEFIANCE CEMENT WORKS,
John Schlembach, Prop.

"Ceresit" Waterproofing

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Ceresit is sold all over the world in barrels and [illegible] gallon jacketed cans labeled [illegible] CERESIT is catalogued in "Sweet's" Index. Agents wanted in unoccupied territory.

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Stand Pipes and Water Towers for Corporations a Specialty

Expert Builders of

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MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

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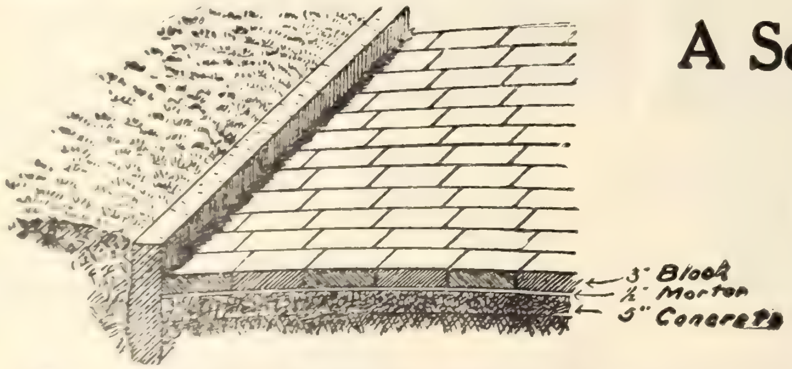
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL



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WIRE ROPE MANUFACTURERS,

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ELECTRIC CABLEWAY OVER THE ZAMBESI RIVER AT THE VICTORIA FALLS.
Span, 870 feet. Working Load [illegible] Main Cable [illegible] Breaking Stress of Main Cable 275 tons.
Main Cable supplied by Thos. & Wm. Smith Ltd., Newcastle-on-Tyne.

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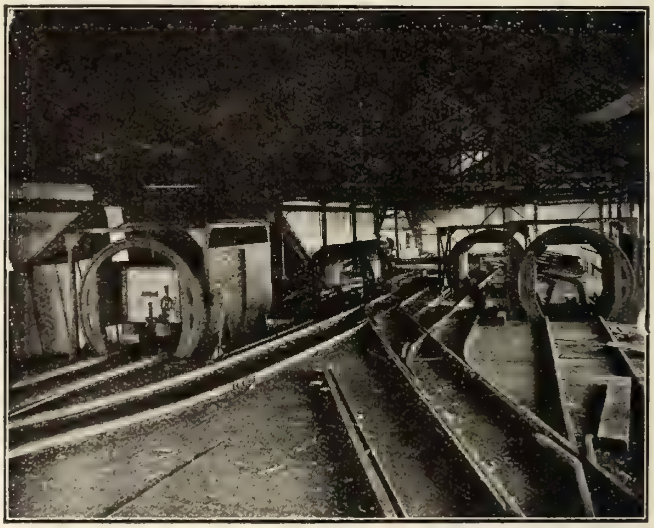

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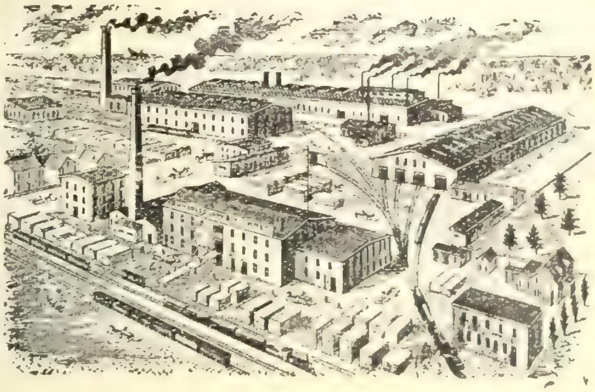

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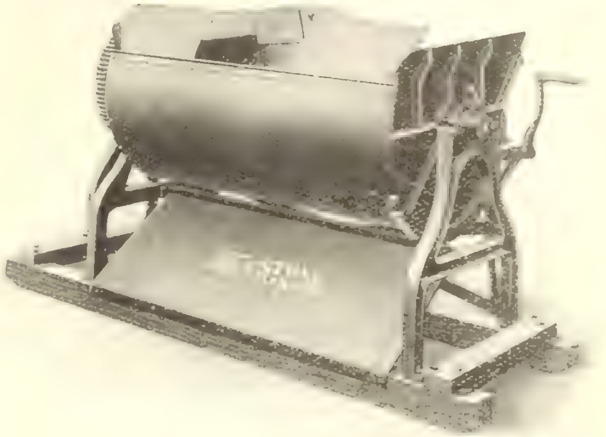

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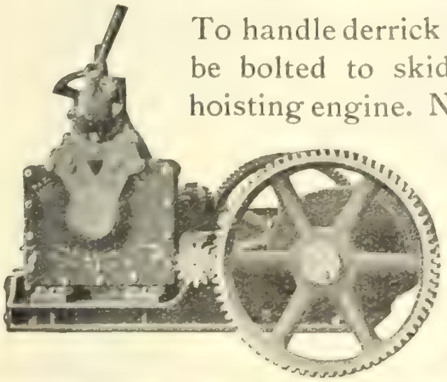

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No. 1 dry pressed buff brick	18 00
Red stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

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2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	27 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving..	36 00	40 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	27 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

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4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8 in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

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X. B. Extras	3 75
X. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

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7 in. at small end, each	35
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	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
85	5 30	8 25
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

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41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

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No. 4½ Fuller's	net $2.50

Square head brass cocks, 60 per cent.

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⅜ "	2.04	⅜ "	2.86
½ "	2.72	½ "	3.57
¾ "	3.16	¾ "	4.31
1 "	4.54	1 "	6.19
1¼ "	6.19	1¼ "	8.44
1½ "	7.43	1½ "	10.13
2 "	9.90	2 "	13.50
2½ "	15.80	2½ "	21.56
3 "	20.75	3 "	28.31

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9-in.	65c ft.	20-in.	2.25 ft.
12-in. .. .	1.00 ft.	24-in.	3.25 ft.

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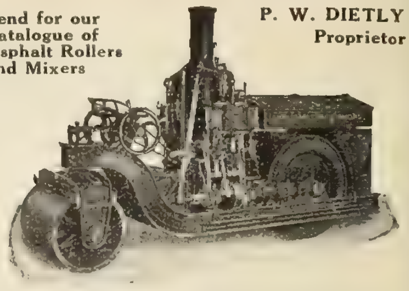

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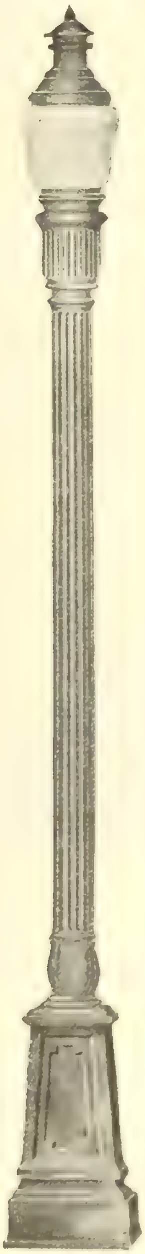

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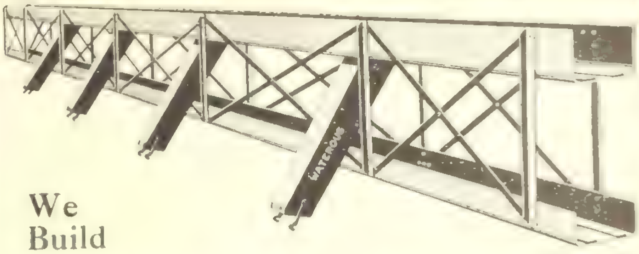

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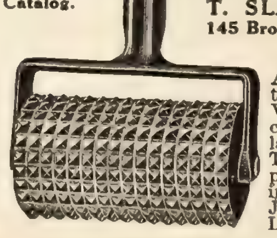

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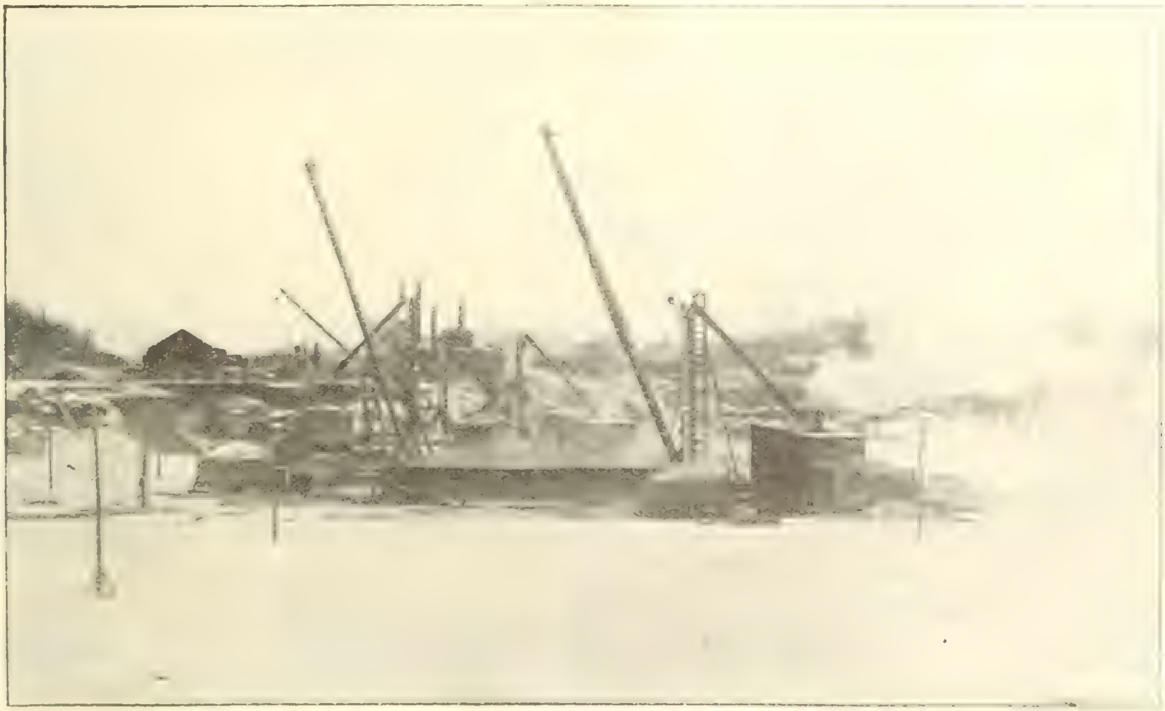

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to Secure Space in the

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ARENA April 12th—April 19th 1913?

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No reservations after April 7th next.

Write or wire your needs immediately to

The Montreal Real Estate Show Company

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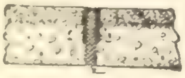
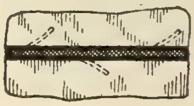


Cross Section of Pavement Showing Expansion Joint.

Baker Armored Concrete Pavements



Longitudinal Section Showing Joint.

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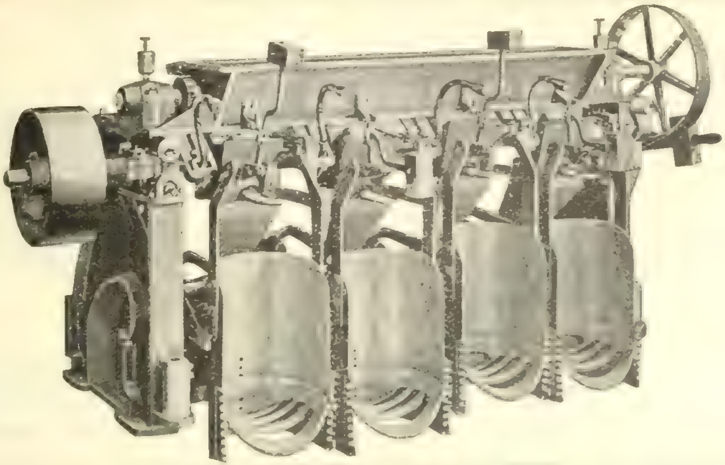

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Feb. 27th, 1913. C No. 121583
PLANS BEING PREPARED
CHEMICAL WORKS, $2,000,000
SANDWICH, ONT.
Owner—Canadian Alkali Company, Limited.
Manager—H. S. Dodson, Manning Block, Windsor.

Plans are being prepared by owner and mechanical engrs.
Tenders will probably be called in May for
buildings and equipment.
12 bldgs., smallest 50 x 50, largest 200 x 150,
Concrete foundations,
Brick (common) walls 4 ft. high.
Metal sash for balance of walls of buildings.
Roof—Prob. reinforced concrete tile.
Heat—Steam, from power plant, owners will do.
Plumb.—Owners will do.
Elec. Work—Lighting & Power.
Struc. Steel—Roof trusses and columns, beams and girders.
Cut stone—Local or Bedford.
Concrete floors.
Glass—Ribbed, wire and sheet.
Pile Driving—None.
Caissons—None.
Boilers and Setting—400 H.P. Boilers and Equipment.
Engines—1, 1300 H.P.
Generators and Motors—direct connected, 900 K.W.
High pressure piping—good quality, owners will do.
Stacks—steel, several.
Cranes—3 elec. and hand power, 3 to 15 ton cap.
About 20 pumps, different sizes, some centrifugal.
About 30 motors (elec.) 10 H.P. to 60 H.P.
900 Motor generator, 13 200 volt motor.
250 Volt direct current generator.
1 Elec. light outfit, about 300 K.W. Elec. Switchboard arc lamps.
6 Vacuum pan evaporators for salt and caustic.
Belt Conveyors.
Automatic weighing machines.
Track scales.
3 Salt wells 1400 to 1600 ft. deep.
Wrot. iron pipe from 6 to 30 inch diam.
Coal and ash handling machinery; monorail system.
Caustic soda works pots.
Glass lined steel tanks.
Cask and drum and barrel making machinery.
Chemical stone ware.
Some coppersmithing.
Refrigerating plant none.

☛ The above report was published Feb. 27.

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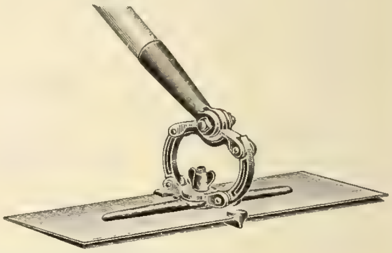

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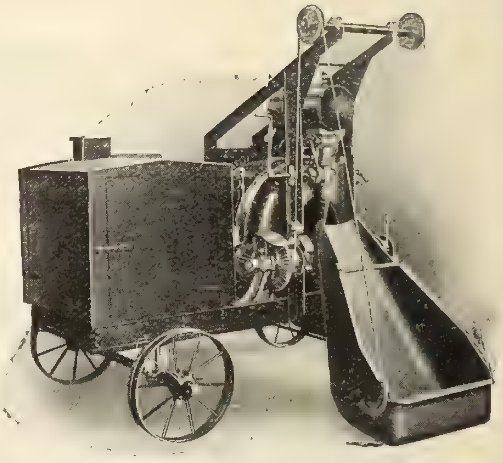
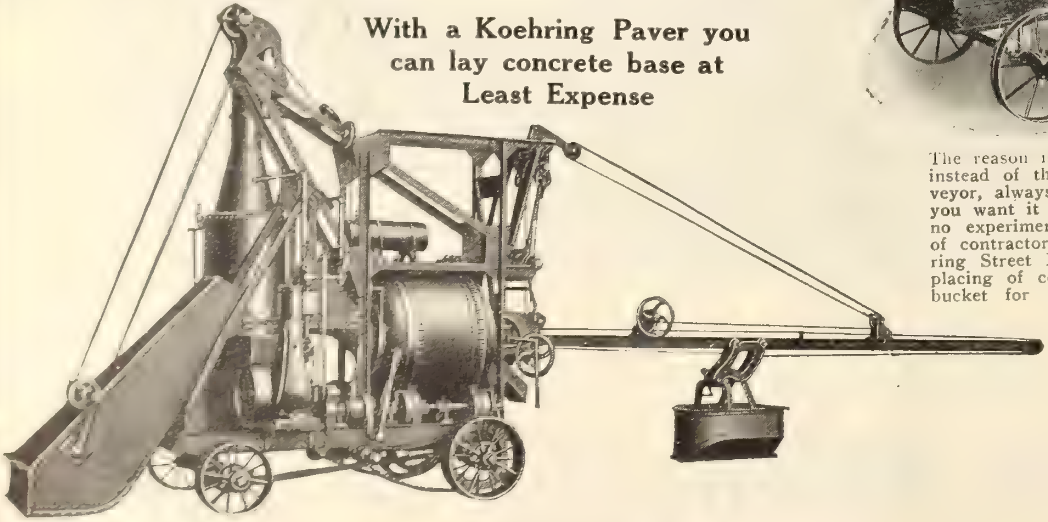


With a Koehring Paver you can lay concrete base at Least Expense



The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds contractors' reputations and pays handsome profits. Aren't you interested in this reputation and profit making?

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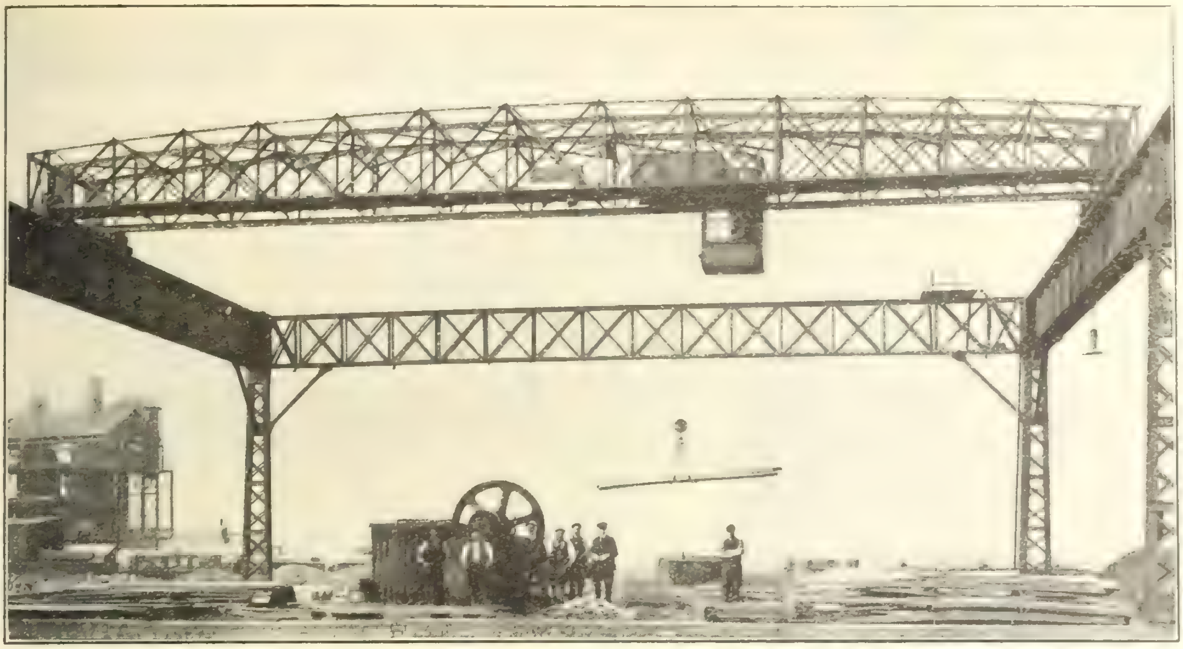

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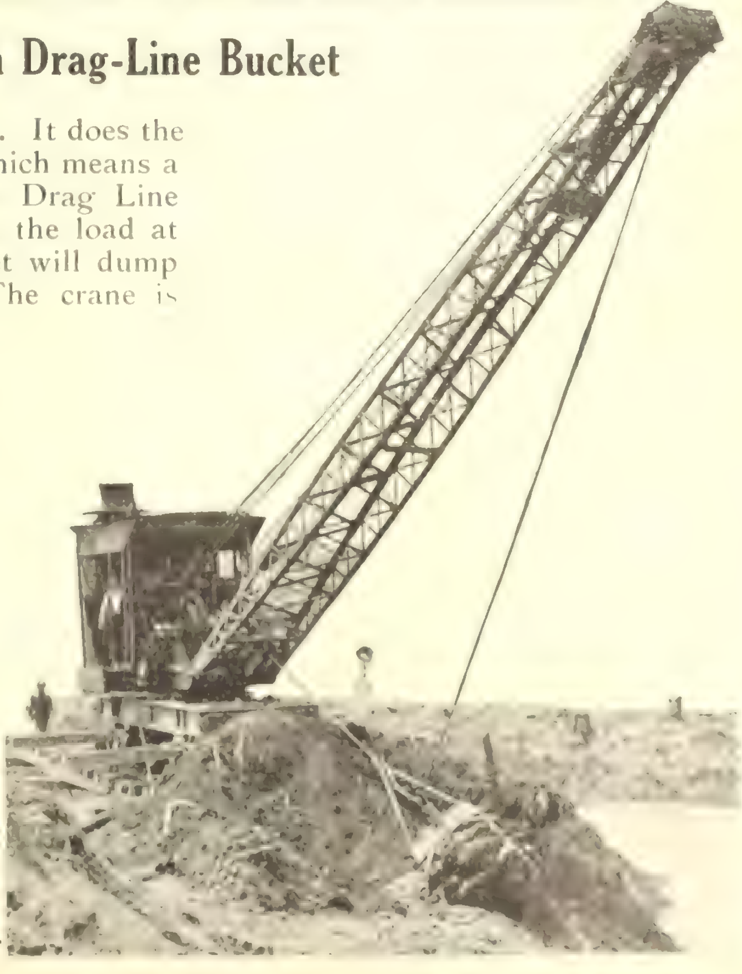

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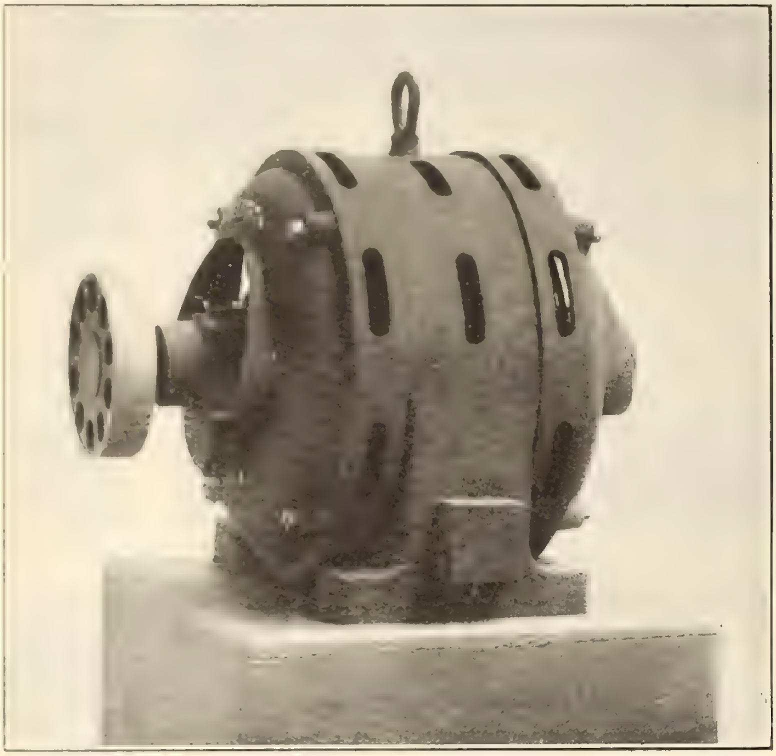

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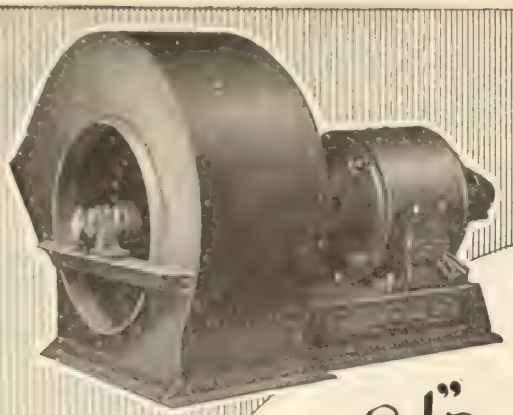

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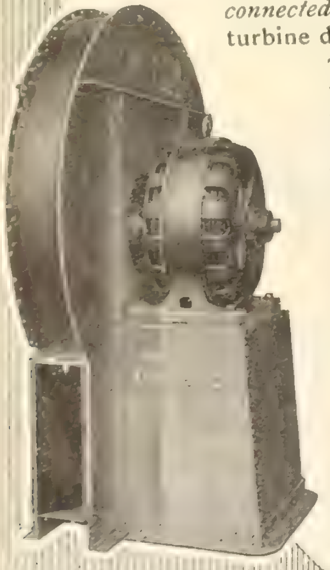

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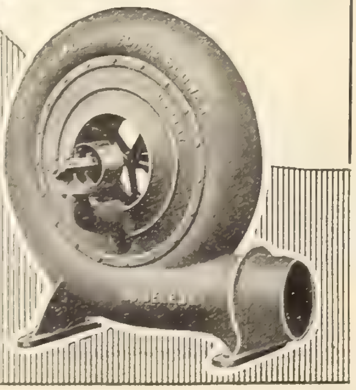

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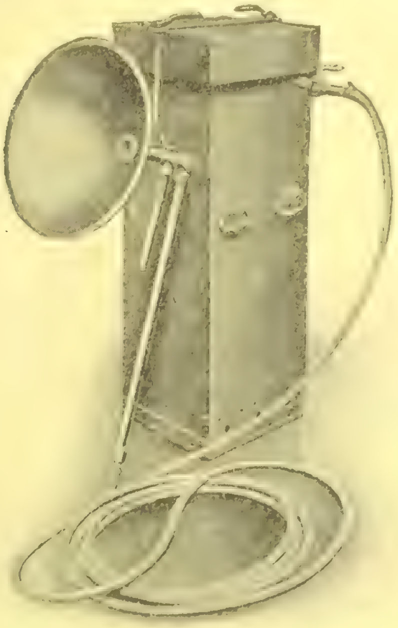

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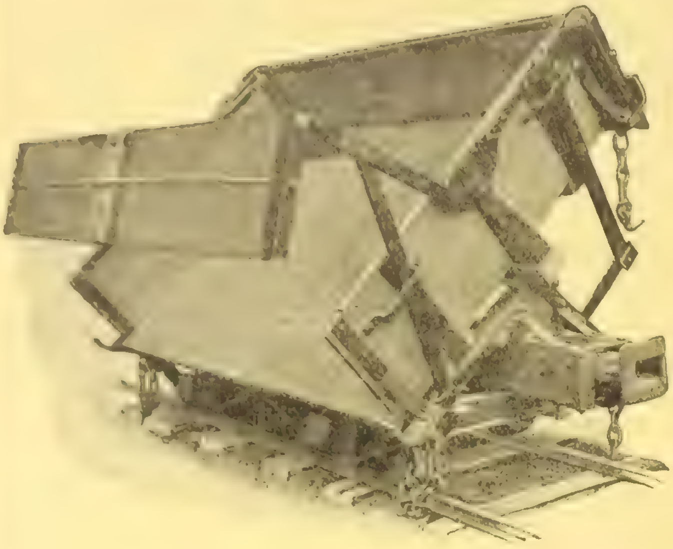

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Our Cars are declared by steam shovel and car men to be superior to all others, both in construction and operation.

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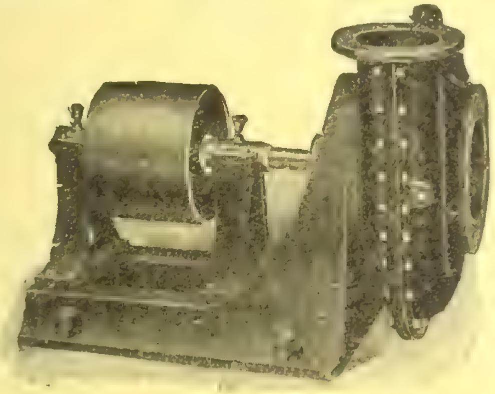
Vol. 27 Toronto, April 9, 1913 No. 15

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps, Condensers, Travelling Cranes



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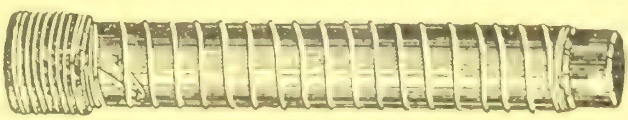

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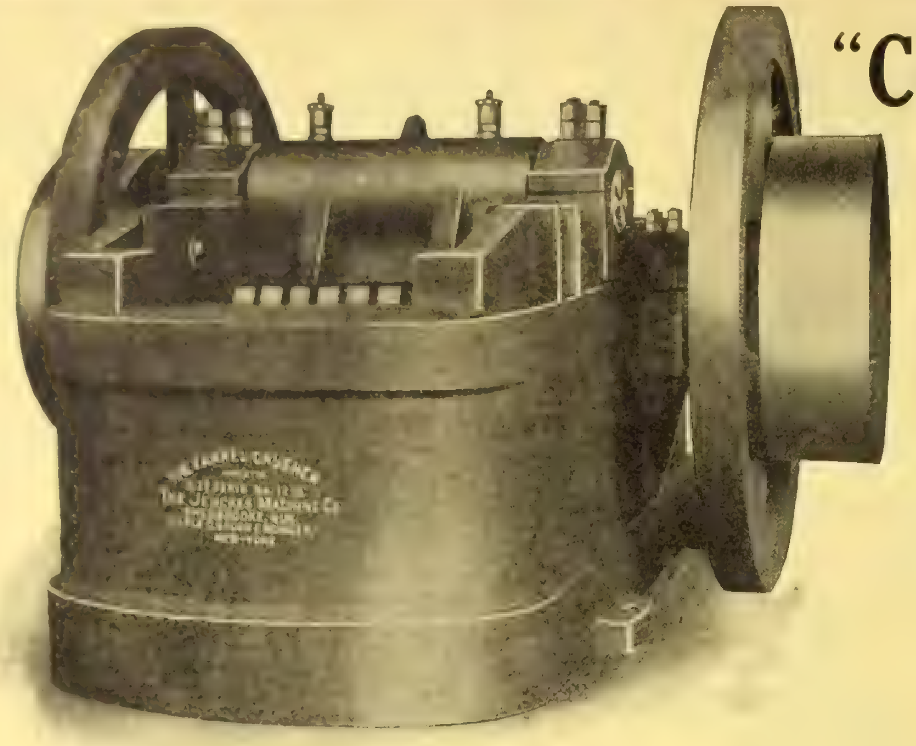
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page



"CRUSHERS"

Complete
Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

*Ask for Copy of
New Catalogue*

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. Works: Sherbrooke, Que. - St. Catharines, Ont.

Sales Offices:—Sherbrooke, Montreal, St. Catharines, Cobalt, So. Porcupine, Vancouver, Nelson

"AMERICAN" DERRICK ENGINE

CROWD IT

RUSH IT — JAM IT

UP WITH WORK — THERE'S NO DANGER
OF THE

"AMERICAN" Hoisting Engine

"LAYING DOWN"

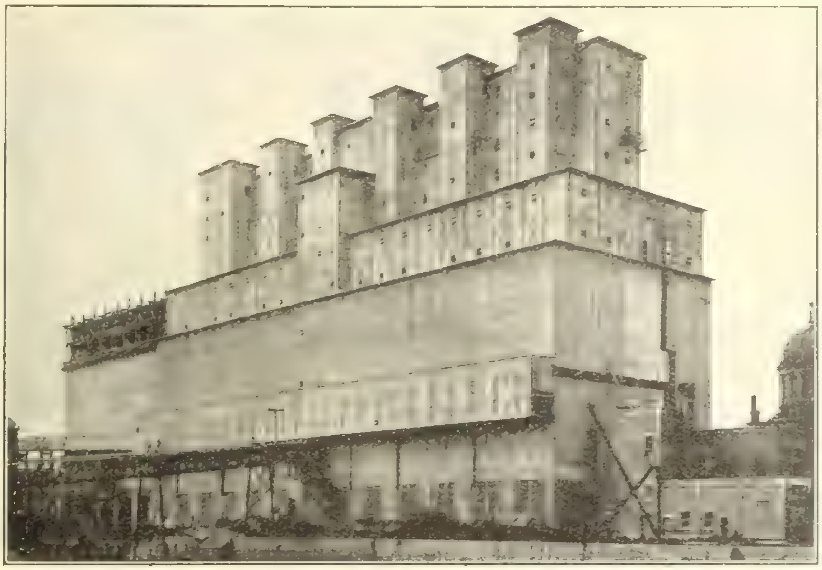
IT STANDS FIRM UNDER THE HARDEST DUTY
IT PULLS TO THE LIMIT
IT'S THE ENGINE WITH THE PERFECT FRICTION

If you need EXPERT ADVICE regarding Hoisting Engines, write us

American Hoist & Derrick Co.

ST. PAUL, MINN., U. S. A.

Gorman, Clancey & Grindley, Edmonton, Calgary and Nelson, B.C.
Vancouver Machinery Depot Ltd., Vancouver, B.C.
Stuart Machinery Co., Ltd., Winnipeg, Man.



Built of Canada Cement

The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

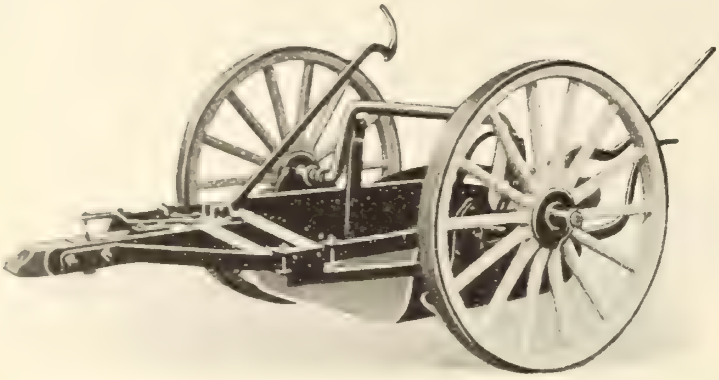
This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

Canada Cement Company
Limited
Montreal

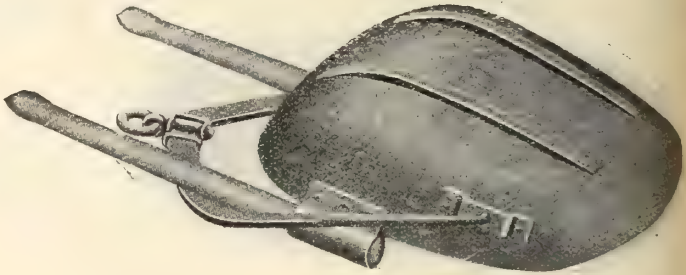
SALES OFFICES:
Montreal Toronto Winnipeg Calgary

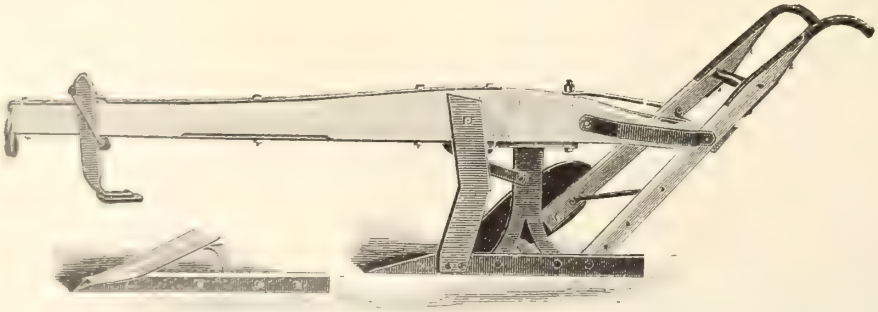
Complete Grading Outfits



carried in stock.

Wheel and **Drag Scrapers**

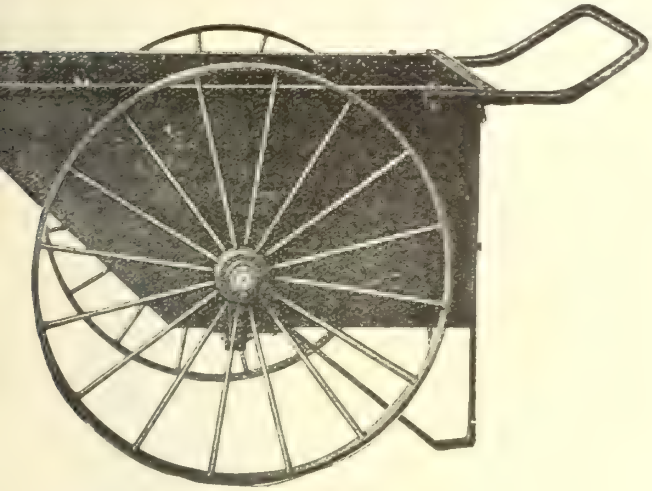


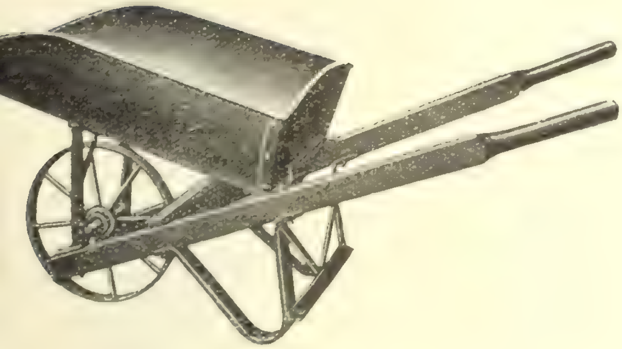


Plows,
Cars,
Wagons,
Etc.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Quebec, 71 Maple Ave., Que.

MUSSENS





"Sterling"

Concrete Barrows

with Self-Lubricating Wheels

and

Carts

with Patent Roller Bearing Wheels

in all styles

Concrete Mixers,

Concrete Distributing Equipment,

Hoists,

Boilers,

Carried in stock.

LIMITED

Winnipeg, 259-261 Stanley St.
Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
St. John, 57 Smythe St., N. B.
Halifax, 78 Granville St., N. S.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

Air Compressors
Canadian Fairbanks-Morse Co
Can. Ingersoll-Rand Co., Ltd.
Escher Wyss & Co.
Canada Foundry Co

Architects
Weeks, Arthur L.

Architects' Instruments
Stanley Co., W. F.
Ainsworth & Sons, Wm

Architectural Iron Work
Canada Wire & Iron Goods Co.
Dennis Wire & Iron Works
Meadows Co., Geo. B.
Steel & Radiation Ltd.

Architectural Metal Works
Metal Shingle & Siding Co.

Architectural Terra Cotta
Asbestos Mfg. Co.
Black Building Supply Co., Ltd.
Don Valley Brick Works
Northwestern Terra-Cotta Co.
Toronto Plate Glass Imp't'g Co.

Asphalt
Canadian Mineral Rubber Co.

Belting
Sawyer Belting Company

Blowers
Canadian Buffalo Forge Co.
Can. Ingersoll-Rand Co., Ltd.
Douglas Milligan Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Boilers
Canadian Boving Co.
Inglis, John
Jenckes Machine Co.
Leonard & Sons, E.
Marsh & Henthorn
McDougall Caledonian Iron Wks
Mussens Limited
Waterous Engine Works Co.

Boxes—Junction
Standard Underground Cable Co. of Canada Limited

Brass Car Fittings
Mitchell Co., Robert

Brewers' Machinery
Linde British Refrigeration Co.

Brick
American Enamelled Brick Co.
Black Building Supply Co., Ltd.
Douglas Milligan Co.
Don Valley Brick Works
Hamilton Pressed Brick Co.

Brick Chimneys
Canadian Kellogg Co.
Douglas Milligan Co.
Heinicke Co., H. R.

Brick Machinery and Supplies
Bechtels Limited
Sheldons Limited

Brick Dryers
Bechtels Limited
Canadian Buffalo Forge Co.

Bridges (Steel)
Canadian Bridge Co.
Des Moines Bridge and Iron Co.
Dickson Bridge Works
Dominion Bridge Co.
Hamilton Bridge Works Co.
Hunter Bridge & Boiler Works
Mackinnon-Holmes & Co.
McNeil & Co., W. P.
National Bridge Co.
Phoenix Bridge & Iron Works
Sarnia Bridge Co.
Structural Steel Co.
Standard Steel Construction Co.

Buckets
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Fairbanks-Morse Co.
Lecky & Collis
Thew Shovel Company

Cable
Canada Wire & Cable Co.
Imperial Wire & Cable Co.
Standard Underground Cable Co. of Canada, Limited

Cement
Alsen Portland Cement Co.
Britnell & Co.
Bremner, Alex.
Canada Cement Co.
McNally & Co., W.
Morrison & Co., T. A.
Rogers, Alfred Limited
Smyth & Ryan

Cement Tools
Abram Cement Tool Co.
Slack, T.

Coal Chutes
Down Draft Furnace Co.

Coal Handling Apparatus
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.

Concrete Mixers and Appliances
Blystone Machinery Co.
Canadian Concrete Appliance Co.
Canada Foundry Co.
Chain Belt Company
Hopkins & Co., F. H.
Jenckes Machine Co.
Koehring Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited
Morrison & Co., T. A.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
Woodstock Wind-Motor Co.

Conduits
Can. H. W. Johns-Manville Co.
Conduits Co., Limited

Contractors
Bennett, Robt.
Eastern Pipe Construction Co.
Foundation Co.

Contractors' Plant and Supplies
American Hoist & Derrick Co.
Bates & Edmonds
Beatty & Sons, M.
Canada Lifting Jack Co.
Canadian Concrete Appliance Co.
Douglas Milligan Co.
Browning Engineering Co.
Brown Machine Co.
Canadian Fairbanks-Morse Co.
Cleveland & Erie Mach. Co.
Dake Engine Co.
Doty Marine Engine & Boiler Co
General Supply Co.
Hamilton Mfg. Co., Wm.
Hepburn, John T.
Hopkins & Co., F. H.
International Marine Signal Co.
Lecky & Collis
Marsh & Henthorn
Montreal Locomotive Works
Mussens Limited
Royce Limited
Stinson-Reeb Builders' Supply Co
Tiffin Wagon Co.
Turner & Sons, J. J.
Urschel Bates & Co.
Vulcan Iron Works
Woodstock Wind-Motor Co.

Core Drills
Can. Ingersoll-Rand Co., Ltd.

Cork Installation Mrchinery
Linde British Refrigeration Co.

Corrugated Iron
Can. H. W. Johns-Manville Co
Metallic Roofing Co.
Ormsby, A. B., Limited

Cranes, Travelling and Locomotive
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.
International Marine Signal Co.
Royce Limited

Creosote Stains
Cabot, Inc., Samuel

Crushed Stone and Granite Sand and Supplies
Smyth & Ryan

Crushers (Stone and Rock)
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Jenckes Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited
Morrison & Co., T. A.

Derricks and Derrick Fittings
American Hoist & Derrick Co.
Hepburn, John T.

Dredges
Beatty & Sons, M.
Browning Engineering Co.

Drills
Beatty & Sons, M.
Canadian Buffalo Forge Co.
Canada Foundry Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis

Drilling Contractors
Harvey, J.

Drill Steel Sharpeners
Canadian Ingersoll-Rand Co.

Dump Cars, Wheels, etc.
Bechtels Limited
General Supply Co.

Electric Air Rock Drills
Canadian Ingersoll-Rand Co.

Electrical Machinery and Supplies
Engineering Works of Canada

Engines
Canadian Boving Co.
Canadian Buffalo Forge Co.
Inglis, John
Jenckes Machine Co.
Laurie & Lamb
Leonard & Sons, E.
McDougall Caledonian Iron Wks.
Mussens Limited
Sturtevant Co. of Can. Ltd., B. F.
Waterous Engine Works Co.

Engineers (Civil) and Mechanical
Barber & Young
Bowman & Connor
Campbell, R.
Chipman & Power
Farmer, John T.
Galt Engineering Co., John
Hancock, H. Syd.
Inglis, John
Kennedy, Jas. C.
Kortring & Green
Lea & Ferguson.
Mitchell, C. H.
Wood and Service

Expansion Bolts
Star Expansion Bolt Co.

Expanded Metal
Mannesmann Tube Co.

Exhaust Heads
Canadian Buffalo Forge Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F.

Field Instruments
Ainsworth, Wm. & Sons
Buff & Buff Mfg. Co.
Gurley, W. & L. E.

Filler, Floor and Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Smyth & Ryan

Fireproof Doors and Windows
Metal Shingle & Siding Co.
Mussens Limited
Ormsby, A. B.
Steel & Radiation Ltd.

Fuse (Safety Blasting)
Lecky & Collis

Forges
Canadian Buffalo Forge Co.

Furnaces (Special)
Improved Equipment Co.

Gas and Electric Light Fixtures
Mitchell Co., Robert.

Gas Plants Complete
Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

Glass
Consolidated Glass Co.
Hamilton Art Glass Co.
Hobbs Mfg. Co.
Luxfer Prism Co.
Toronto Plate Glass Imp't'g Co

Hammer Drills
Canadian Ingersoll-Rand Co.

Heating Apparatus
Canadian Buffalo Forge Co.
Sheldons Limited
Jenckes Machine Co.

High Pressure Pipe Lines
Canadian Boving Co.
Escher Wyss & Co.

Hoisting Apparatus
American Hoist & Derrick Co.
Beatty & Sons, M.
Browning Engineering Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Doty Marine Engine & Boiler Co
Inglis, John
Jenckes Machine Co.
Hopkins & Co., F. H.
Lecky & Collis
Marsh & Henthorn
Mussens Limited
Royce Limited
Sturtevant Co. of Can. Ltd., B. F

Hoisting Engines
Canadian Fairbanks-Morse Co.

Horse Stable Fittings
Beatty Bros.

Hydrants
Canada Iron Corporation
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

Don Valley Clay Products

For over twelve years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Lumsden Building, Toronto

J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.

Don Valley Fireproofing, Bricks and Tile used throughout.

Traders Bank, Toronto

Carrere & Hastings and F. S. Baker, Associate Architects.

Don Valley Porous Terra Cotta Fireproofing and 2,000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

Royal Bank, Toronto

Eustace G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Bell Telephone Building

Adelaide Street, Toronto

W. J. Carmichael, Architect. Wickett, Limited, Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

A "Steelcrete" Bridge

The illustration shows one of the first reinforced concrete bridges in America and the first in Canada.

Completed less than three years ago it has proved such a success that over two hundred highway bridges throughout Canada have been erected along similar lines.

Rod reinforcement was used for all portions except the floor slabs which were reinforced with

"Steelcrete" Expanded Metal

If you have a stream to cross, erect a permanent crossing—a **"Steelcrete"** reinforced bridge. Are you in touch with our designing department?

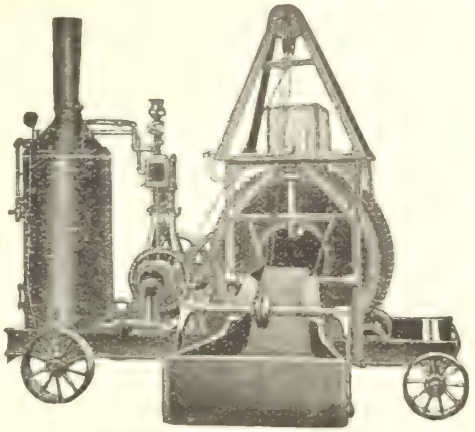
Steel and Radiation, Limited
Toronto, Canada

Have You Seen Our 1912 Catalogue On Concrete Machinery?

London Automatic Batch Mixer No. 1

It's a dandy 160 pages illustrations.

Showing the Largest Line of Concrete Machinery ever crammed into a catalogue.



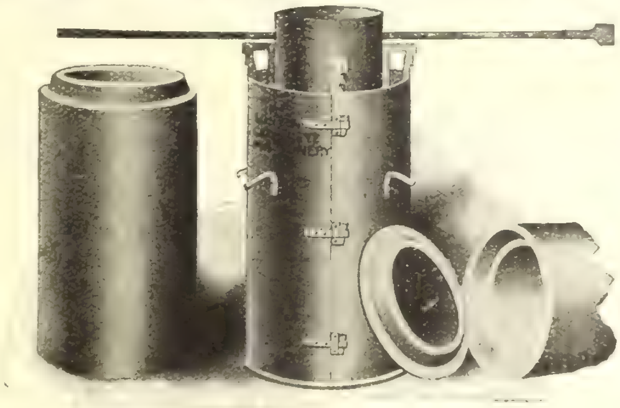
Standard Drum Batch Mixer

All Made in our Own Factory and under a system producing an Excellence of Quality. Our large output Right from Factory to the Contractor.

Even such remarkably low prices are preferable to exorbitant prices and small output

Some people wonder how we can sell high grade machinery at such low prices

IT IS QUITE SIMPLE

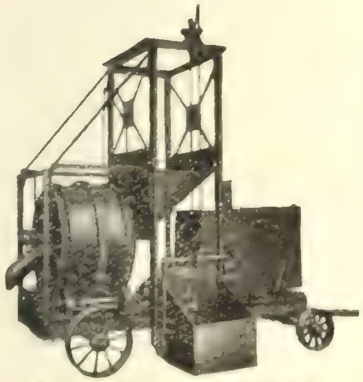


London Sewer Pipe and Tile Moulds

We manufacture over twenty different sizes and styles of

Concrete Mixers
Mortar Mixers
Concrete Block Machines
Cement Brick Machines
Cement Tile Machines
Tile Moulds
Rock Crushers
Screen Sand Elevators

Our Enormous Sales and Small Profits are Sufficient Explanation.



London Paving Mixer with Side Lift and Rear Discharge

Gasoline Engines
Pumping Outfits
Steam and Gasoline Hoists
Material Elevators
Sidewalk Forms
Sidewalk Tile Machines
Concrete Carts
Wheel Barrows
Sill Step and Window Cap Moulds
A complete line of Cement Working Tools

London Automatic Batch Mixer No. 2

London Concrete Machinery Co. Limited

Cabell St. and Kitchener Ave., LONDON, ONT.

BRANCHES:

WINNIPEG, (445 Main St.) **W. H. Rosevear, Mgr.**
CALGARY, (622 9th Ave. W.) **P. D. McLaren, Mgr.**
TORONTO (60 Richmond St. W.) **F. D. Emsley, Mgr.**
HALIFAX, (106 Pleasant St.) **G. B. Oland, Mgr.**

AGENCIES:

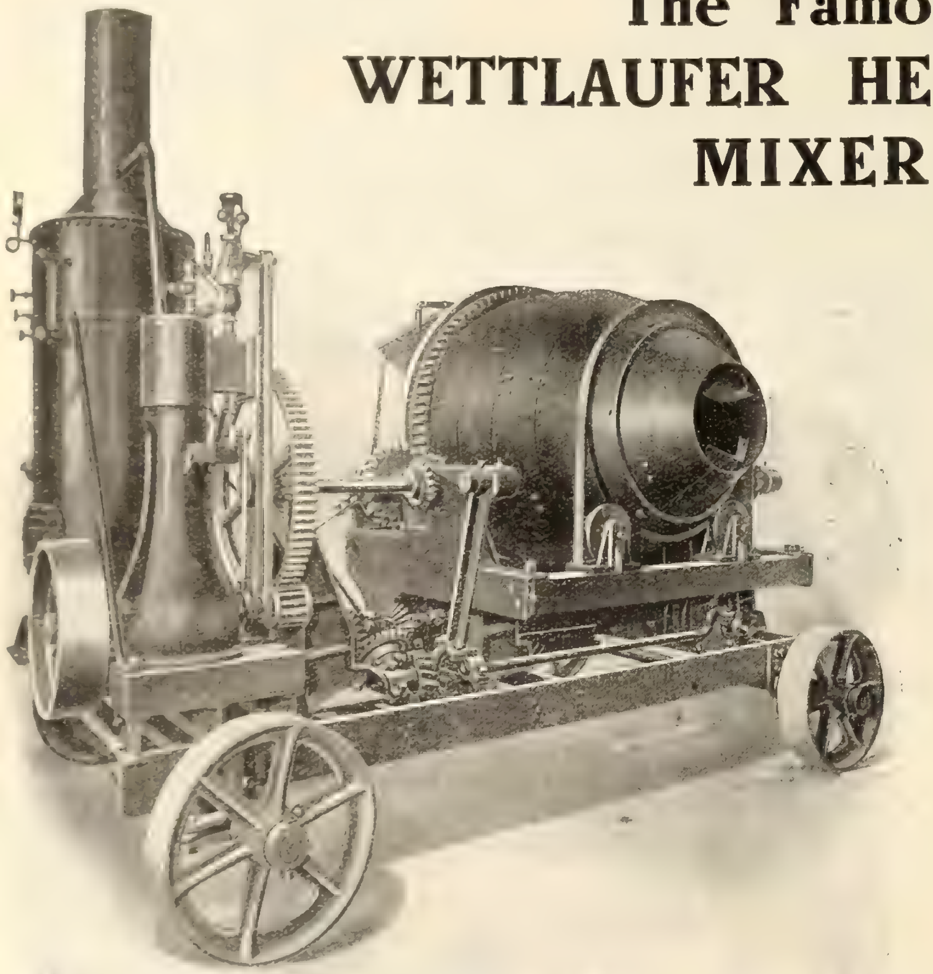
VANCOUVER, B. C. Equipment Co.,
MOOSE JAW, SASK., Bridge & Iron Co., Ltd.
REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co
MONTREAL, Foss & Hill Mach. Co.,
QUEBEC, Rene Talbot

EVENTUALLY

—WHY NOT NOW?

You **must** have a **Good Mixer** some time—You can't go on putting up with a poor makeshift—You will realize some time that you **must** have a mixer that will do the best work, and when you realize that you will naturally turn to

The Famous WETTLAUFER HEARTSHAPE MIXER



This is the mixer that will do **good work** for you **all the time** — the mixer that saves you time and money and increases the efficiency of your equipment.

Strong Construction

Automatic Operation

Low Working Cost

Rapid and Perfect Mixing

Increased Capacity

Minimum Repairs

Full particulars and catalogue on request.

Come and see this mixer working—Continuous demonstrations at

WETTLAUFER BROTHERS

TORONTO, ONTARIO

FACTORIES: **Mitchell, Ont.** **Buffalo, N. Y.** **Detroit, Mich.**

AGENCIES:

A. R. Williams Machinery Co.
15 Dock St., St. John, N. B.

Lavallee Ross, Limited
Alexandra Block, Howard Ave.
Edmonton, Alta.

Hooton & Moore
613 Ashdown Block,
Winnipeg, Man.

MONTREAL OFFICE and WAREROOMS: **316 Lagauchetiere St. W.** **Head Office: TORONTO, Ont., 178 Spadina Ave.**

ROGERS'

CEMENT
AND
CRUSHED STONE

Municipal Bridges and Buildings

built of concrete made with Rogers' cement and crushed stone will last as long as the city itself, requiring the minimum of repairing. See that your contracts call for Rogers materials.

Cement and crushed stone from our mills are always of uniform quality.

Mills at : — Kirkfield, Owen Sound Hanover, Orangeville, St. Mary's, Dundas and Vinemouth

ALFRED ROGERS
LIMITED
28 KING WEST TORONTO

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

Ice-making Machinery
Linde British Refrigeration Co
Insulating Compounds
Canadian Mineral Rubber Co.
Standard Underground Cable Co of Canada, Limited

Interior Finish and Doors
Batts Limited
Canada Office & School Fur. Co.
Oshawa Int. Fittings Co.
Rhodes Curry & Co.

Kilns
Canadian Buffalo Forge Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Lime
Jamieson Lime Co.
Ontario Lime Association

Lime Kilns
Improved Equipment Co.

Locomotives
Buffalo Pitts Co.
Canadian Boving Co.
Montreal Locomotive Works
Canada Foundry Co.

Marble
Dominion Marble Co.
Lautz Company
Mississquoi Marble Co.

Metal Lath
Greening Wire Co., B.
Metallic Roofing Co.
Noble, C. W.
Steel & Radiation Ltd.

Metal Forms
Hotchkiss Lock Metal Form Co.

Meters, Electrical
Ferranti Electrical Mfg. Co.

Meters, Water
Hopkins & Co., F. H.
McDougall Caledonian Iron Wks
Neptune Meter Co.

Motor Trucks
Jones & Glassco

Packing and Pipe Coverings
Garlock Packing Co.

Paints (Bridge and Structural Iron and Pipe Coating)
Canadian Mineral Rubber Co.

Paints and Varnishes
Elaterite Paint Co.
Goheen Co.
Pinchin, Johnson & Co.

Paving Cement
Canadian Mineral Rubber Co.

Paving and Paving Materials
Dominion Creosoting Company
Metropolitan Paving Brick Co.
Ontario Asphalt Block Co.
Paterson Mfg. Co.

Perforated Metals
Canada Wire & Iron Goods Co.
Greening Wire Co., B.

Pipe (Concrete, Iron and Wood)
American Spiral Pipe Works
Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Pedlar People Limited.
Piggott & Co., Thos.

Pile Driving Machinery
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis
Vulcan Iron Works

Planing Mill Exhausters
Canadian Buffalo Forge Co.
Sheldons Limited

Plaster
Alabastine Co.
Albert Mfg. Co.
Britnell & Co.
Crown Gypsum Company

Plug Drillers
Canadian Ingersoll-Rand Co.

Plumbers' Supplies
Standard Ideal Co.
Plumbers and Steam Fitters Brass Goods
Mitchell Company, Robt.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.

Portable Saws
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

Power Engines
Inglis Company, John

Pumps and Pumping Machinery
Bates & Edmonds
Beatty & Sons, M.
Canada Foundry Co.
Canadian Boving Co.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Cook, A. D.
Escher Wyss & Co.
General Supply Co.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Inglis & Co., John
McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
Waterous Engine Works Co.
Mussens Limited
Ontario Wind Eng. & Pump Co.

Quarry Machinery
Canadian Ingersoll-Rand Co.
Improved Equipment Co.
Lecky & Collis
George Anderson & Co.

Railway Supplies
Gartshore, John J.
Hopkins & Co., F. H.
Mussens Limited

Refrigeration Machinery
Linde British Refrigeration Co.

Reinforcements, Concrete & Steel
Ambursen Hydraulic Cons. Co.
Canada Steel Co., Ltd.
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Co. of Canada
Steel & Radiation Ltd.
Trussed Concrete Steel Co.
Turner, C. A. P.

Revolving Stone Screens
Greening Wire Co., B.

Road Asphalt
Canadian Mineral Rubber Co.

Road Machinery
Erie Machine Shops
Lecky & Collis
Morrison & Co., T. A.
Mussens Limited
Waterous Engine Works Co.
Western Wheeled Scraper Co.

Roofing Material
Asbestos Mfg. Co.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Canadian Supply Company
Metallic Roofing Co.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

ACCURATE METERS

Ferranti

Glass Case—Top Connections

In Ferranti meters you have all the good qualities of a perfect meter; absolute accuracy, simple construction, top or bottom connections and perfect workmanship.

We would like to quote you on your meter requirements. Large stocks carried in Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co. of Canada, Limited

TORONTO, 90 Sherbourne St. **WINNIPEG, 56 Albert St.**

Built of Sydney Pressed Brick

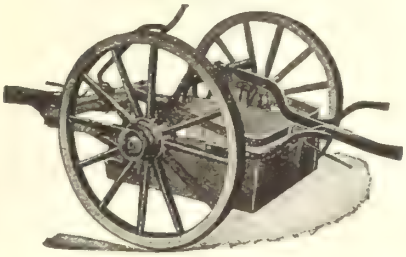
IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

DON'T BE MISLED



THE ORIGINAL
AND ONLY
THOROUGHLY
IMPROVED
WHEELED
SCRAPERS
ARE

Western Wheeled Scrapers

None others are built as strong will give the same satisfactory service or contain the latest improvements.

The Westerns are noted for their capacity, light draft, simplicity and durability. They will shortly pay for themselves, and be paying you a handsome dividend on your investment.

Write for Catalogue.

Western Wheeled Scraper Co.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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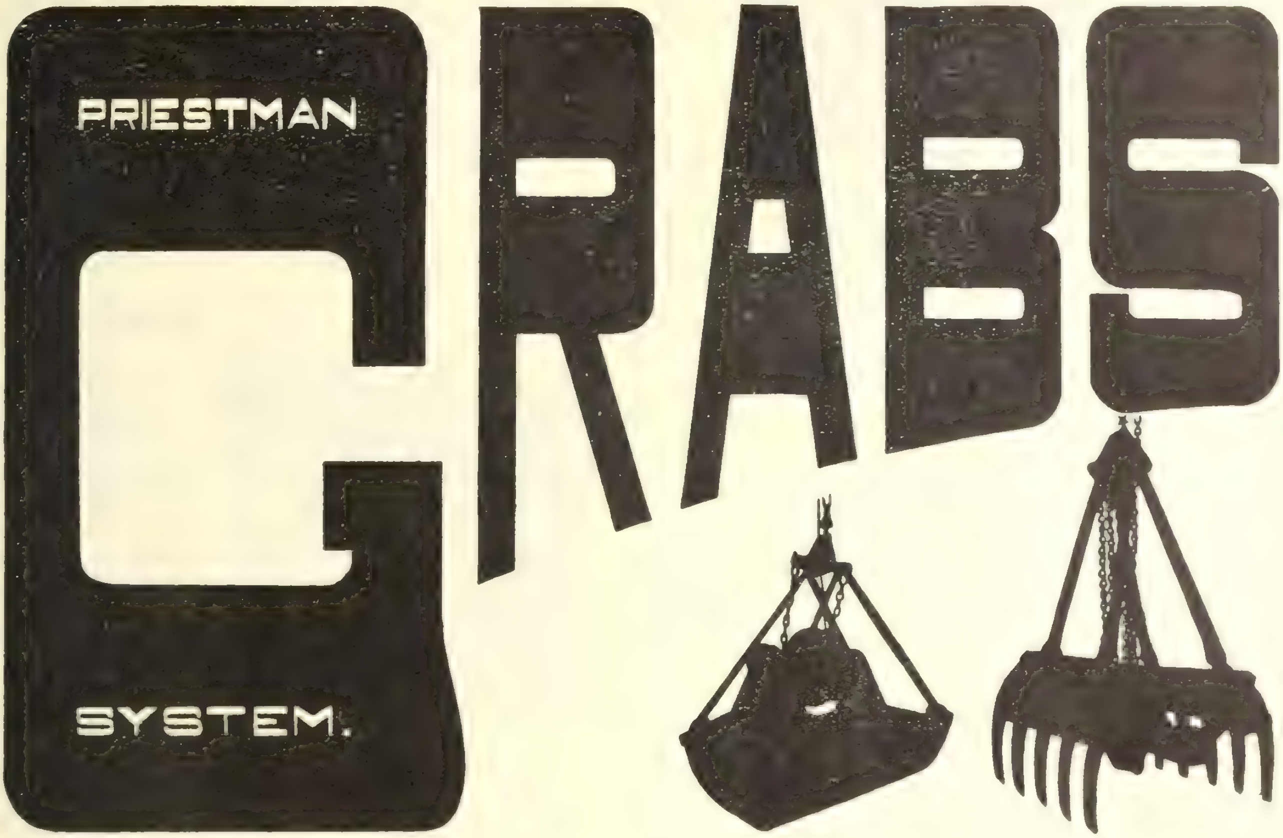

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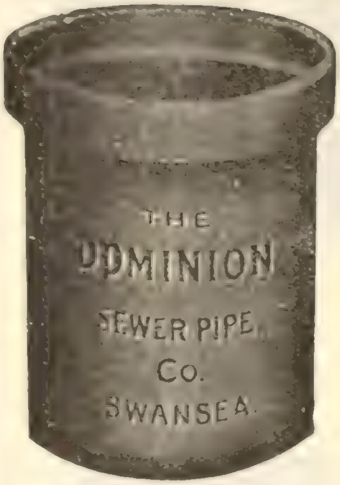

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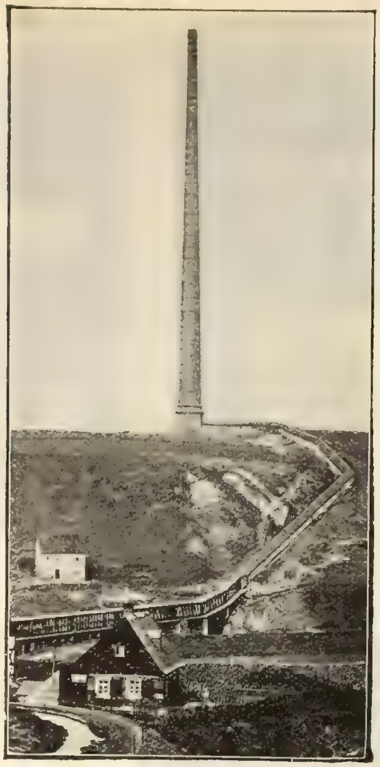

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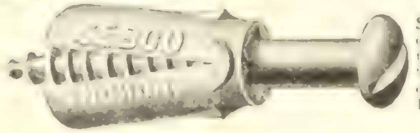

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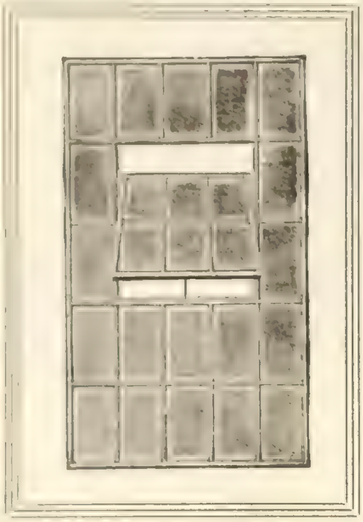

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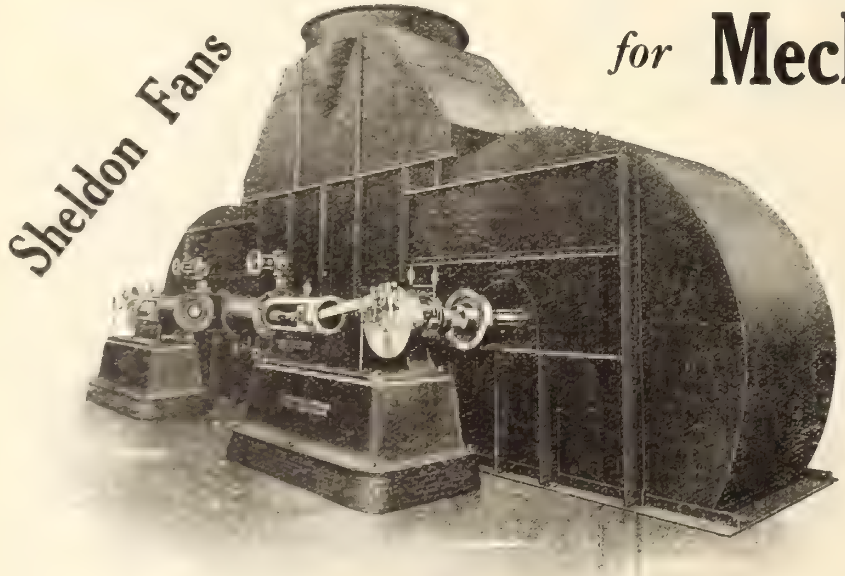

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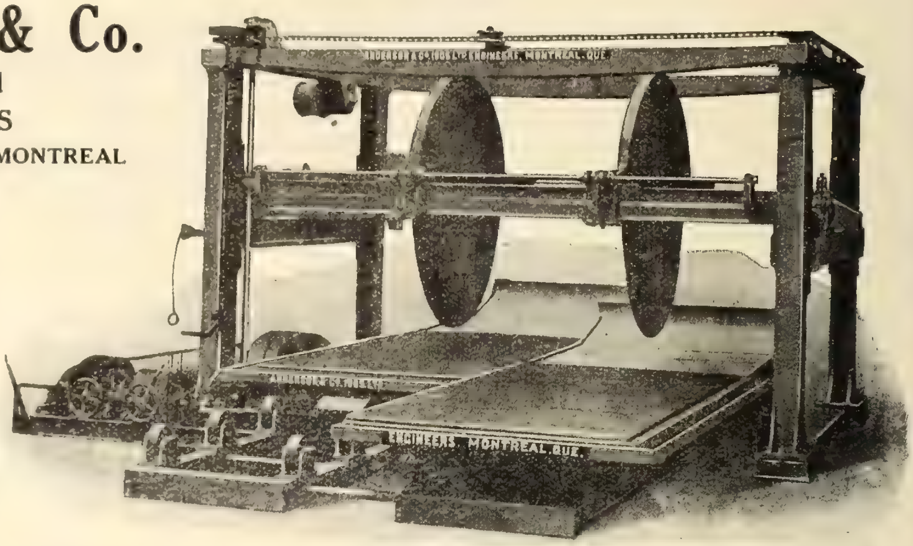

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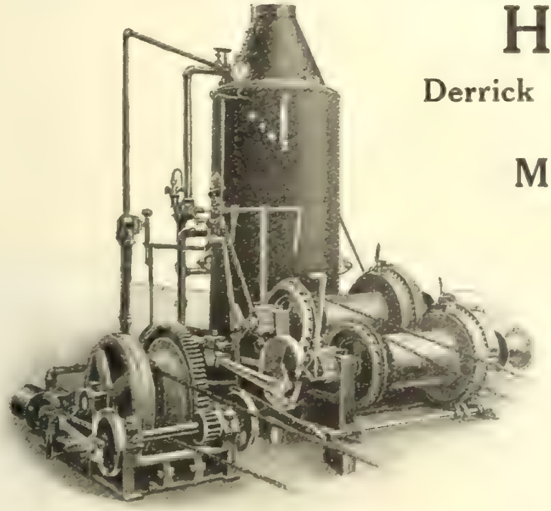

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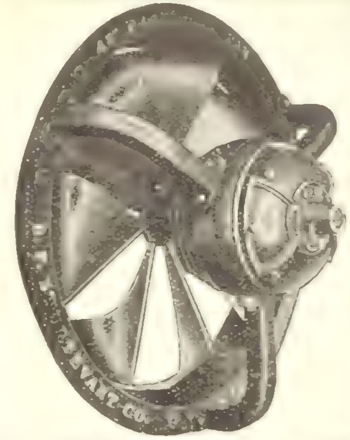

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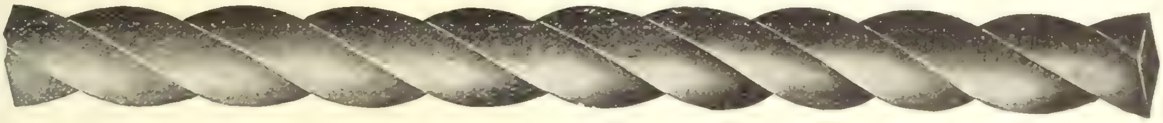

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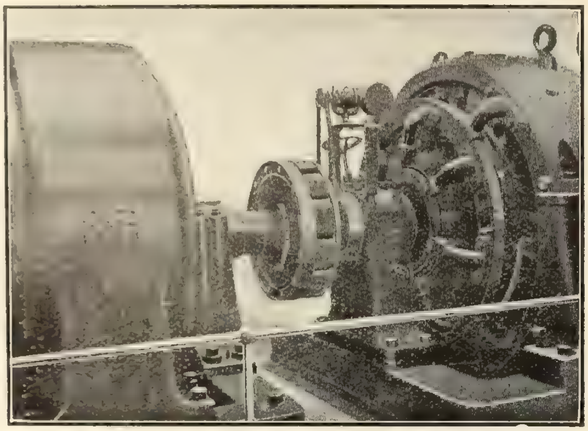

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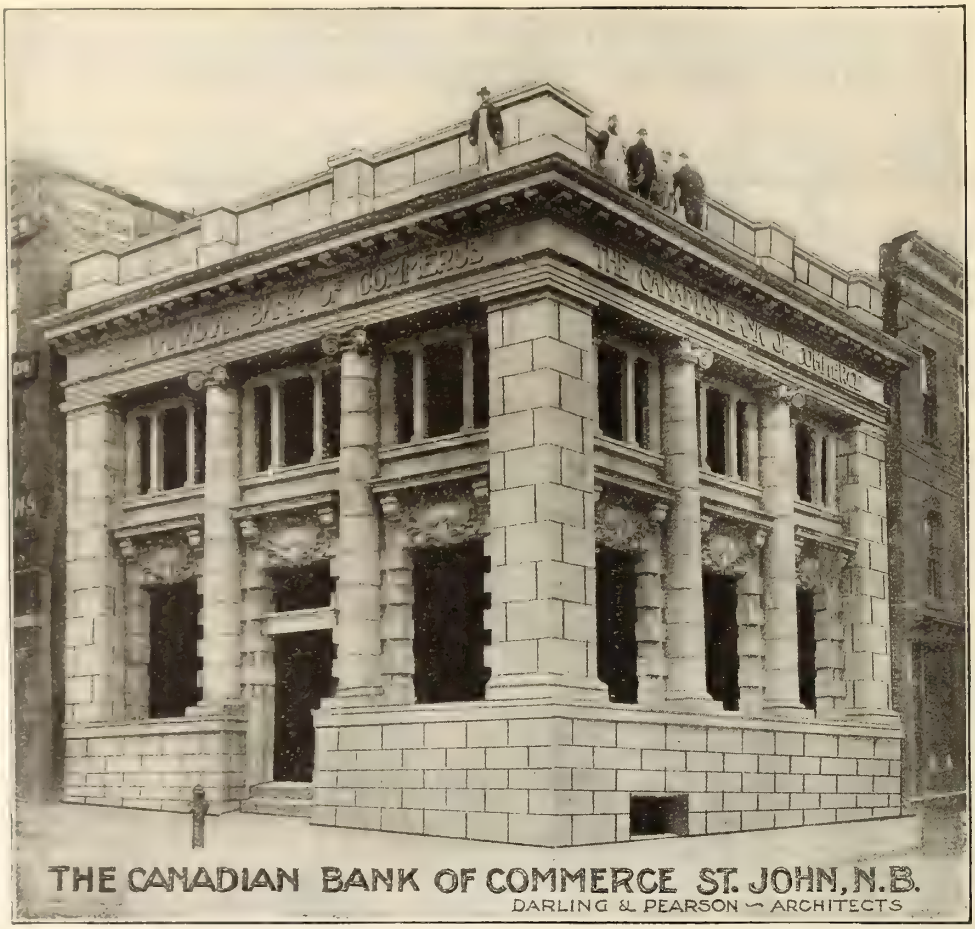

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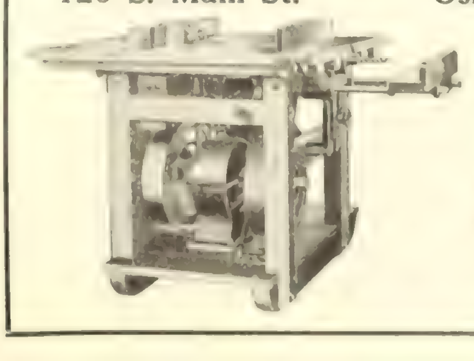

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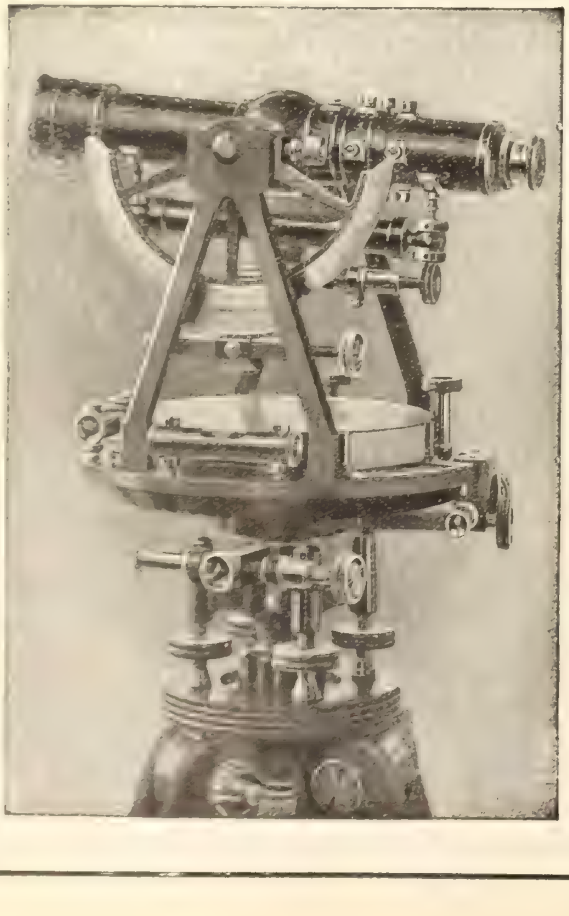

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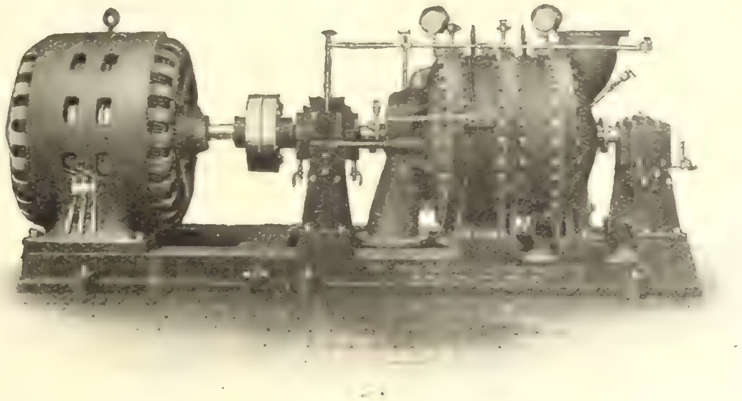

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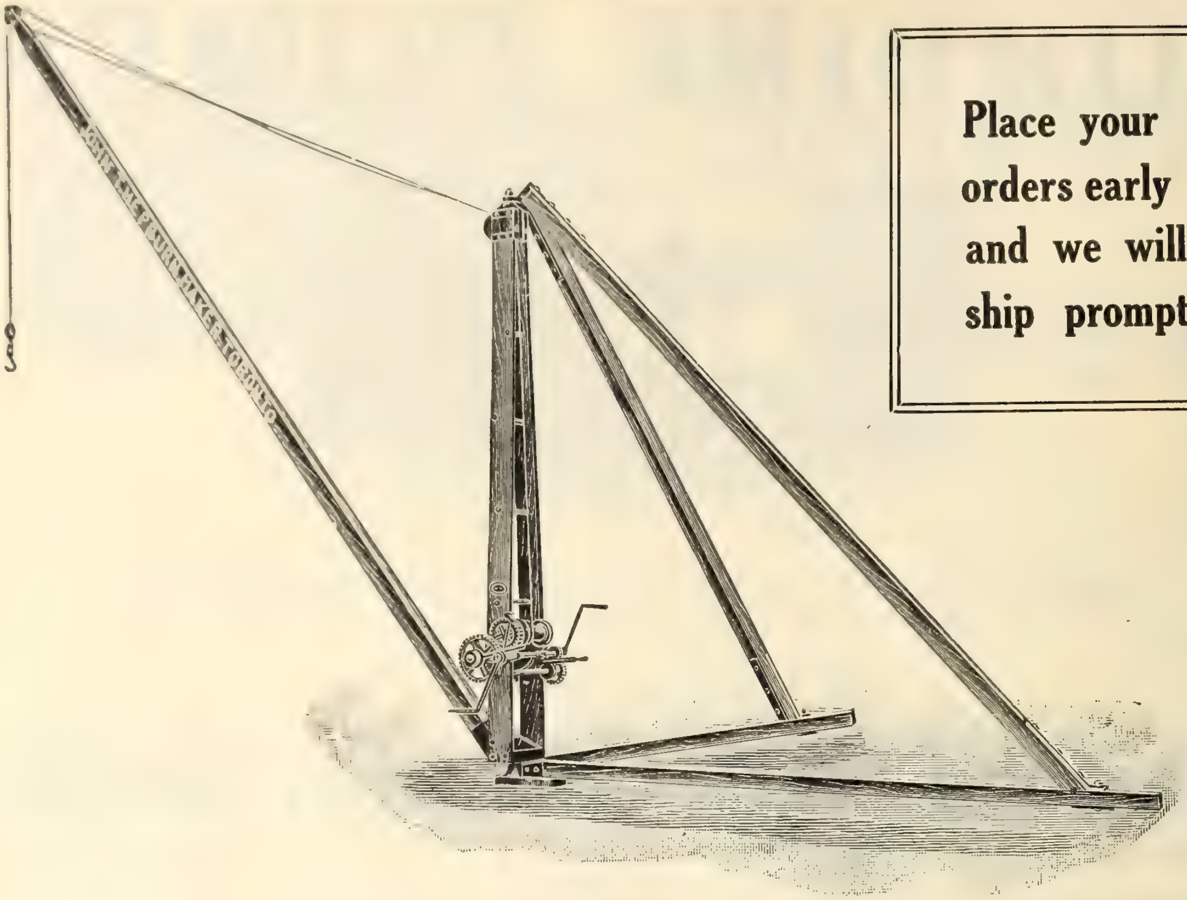
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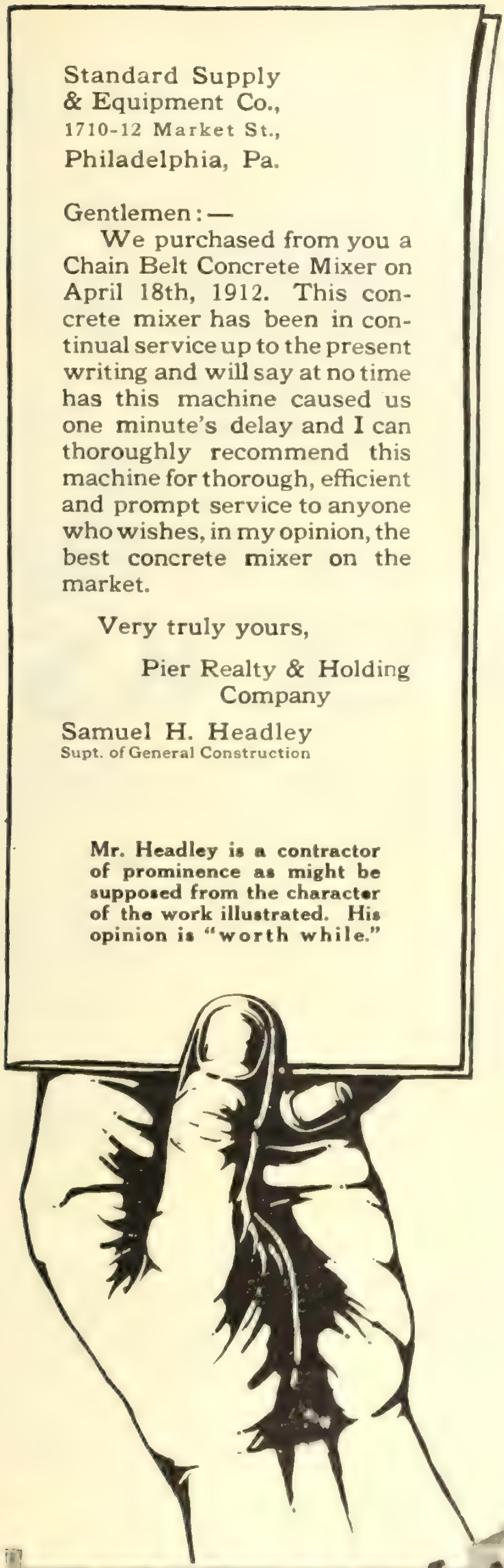

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Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

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The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

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The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

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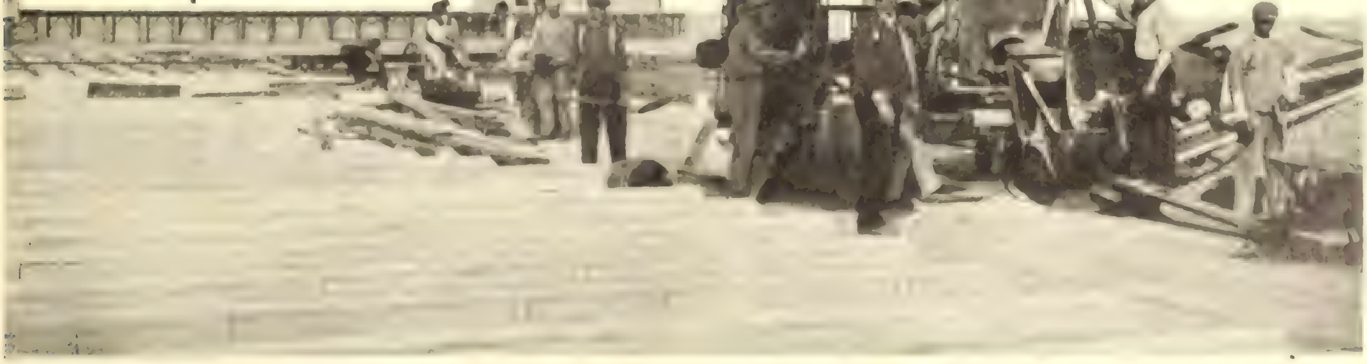
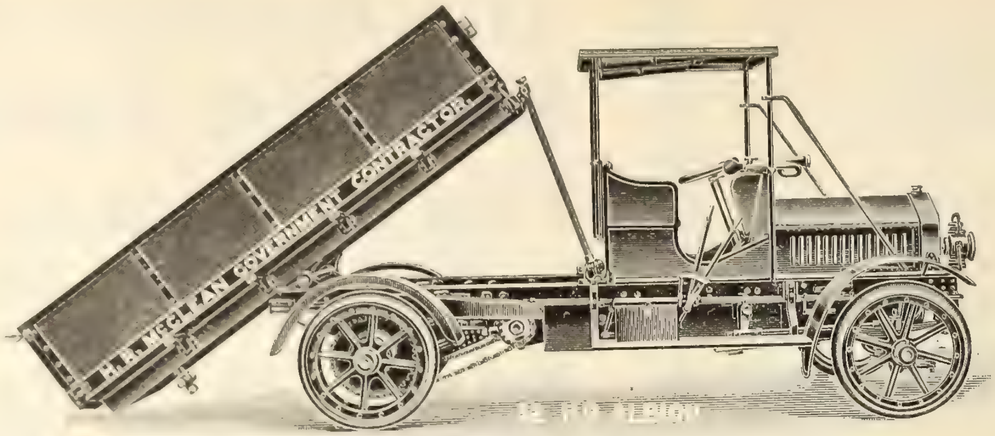


Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.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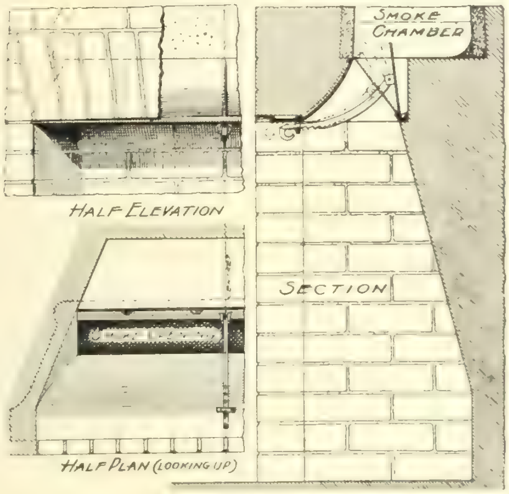

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- Simply and Strongly Constructed.
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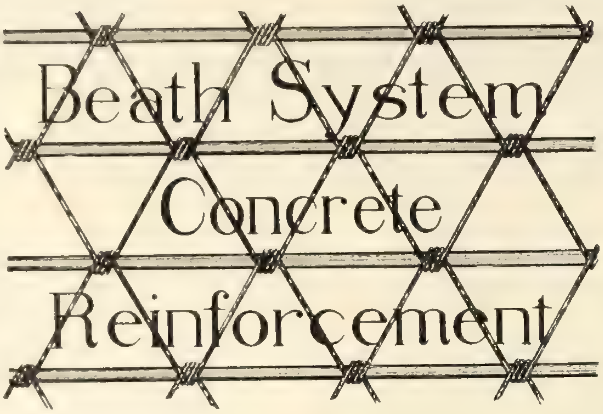

Made of cold drawn mild steel wire, guaranteed tensile strength 90,000 lbs., elastic limit 50,000 lbs. per square inch.

Supplied regularly in rolls 150 ft., 500 ft. and 600 ft. in length, allowing continuous reinforcement over supports. Cut to general length if required.

Main stresses carried on heavy longitudinal or tension members. Diagonal cross wires provided to assist in longitudinal reinforcing and at the same time distribute stresses to main tension members and take care of temperature stresses and strains.

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- No tying or lapping necessary.
- Minimum cost of laying.
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- Absolutely continuous action from end to end in structure.
- Higher elastic limits with the same quality of steel due to cold drawing.
- Every ounce of steel tested, as it cannot be cold drawn without showing defects, if any.
- Diagonal cross wires distribute stresses due to concentrated load over a greater area.
- The only design of fabric reinforcement where cross of diagonal wires assists longitudinal or tension members in carrying the load.
- Supplied black or galvanized, but black is recommended owing to its better bond in concrete.

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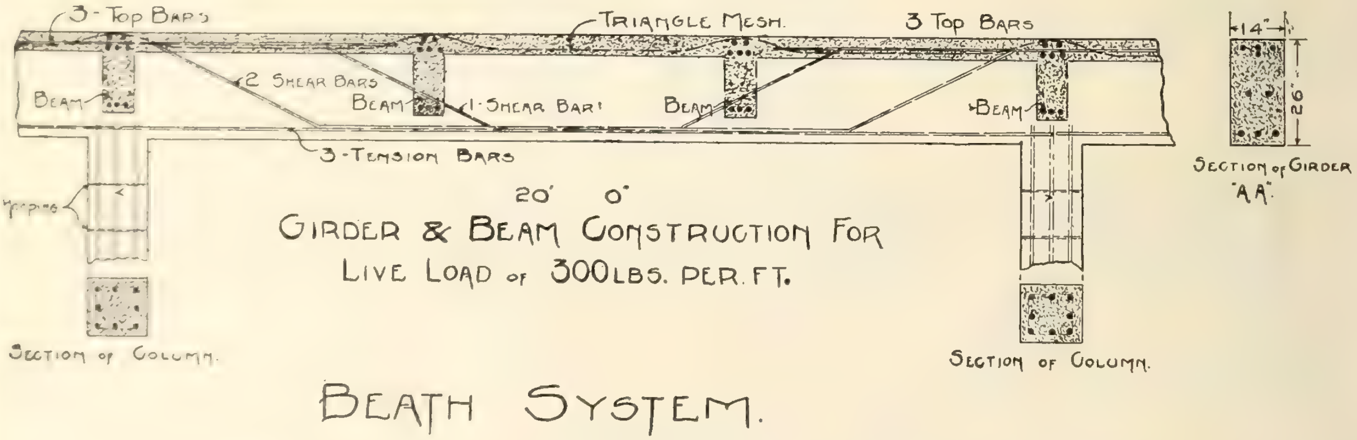

The Beath System Concrete Reinforcement is applicable to any form of concrete construction and offers advantages that cannot be obtained elsewhere. We can show you how to build a fireproof building at the lowest cost possible.

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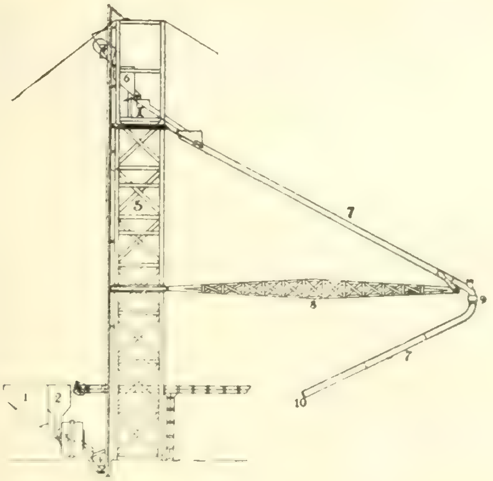

Gravity System Distributing Concrete

A system that improves the concrete and reduces the cost.

Information gladly furnished and Estimates given on any work.

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One proof of this statement is the repeated indorsement of our product by prominent architects, engineers and contractors when they have put "STANDARD" wires into many of the most noted buildings on this continent.

Our Folder No. 69-c gives in an attractive manner a list of such installations and other interesting information regarding electric wires and cables. A copy will be sent you on request.

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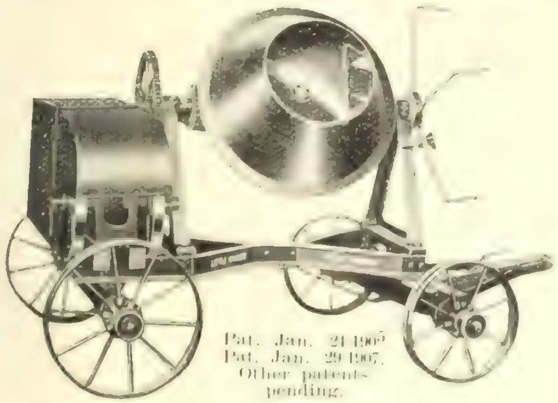

Pat. Jan. 24 1905
Pat. Jan. 29 1907.
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that needs this mixer if you're wise to [illegible] big profits for hundreds of contractors in the States last year—that pays for itself in less than 20 days—that is sold under a "Man to Man" proposition of TEN DAYS' FREE TRIAL (and even this yields a profit)—a mixer that does the work of machines for which you'd pay three times the price—that is absolutely unapproached in profit making capacity by any mixer of similar size in the world.

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"THE SMALL JOB MONEY-MAKER"

Mixes 25 to 35 Cu. Yds. per day at only one cent per Cu. Yd. for gasoline. The original small Tilting Drum Batch Mixer. Charges on one side, discharges on the other. No clogging or choking. Saves $12 per day over hand mixing, also the hard work and does it better.

FOR HEAVY WORK THE LITTLE WONDER "TEN"

Mixes 60 to 90 cu. yds. per day—with Side Loader 120. A 1/3 yd. "sack to the batch." Does the work of heavy, old style mixers with half the initial investment.

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We will send you a LITTLE WONDER "FOUR" or "TEN" to try out on your own work. If you are not fully satisfied with the machine in every particular, notify us within ten days and we will tell you where to ship it, and refund the freight you have paid.

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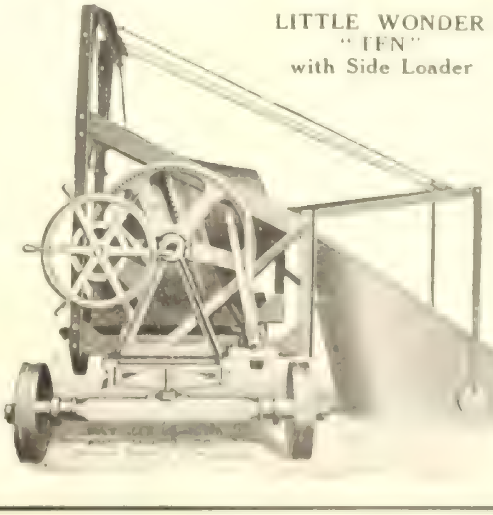
"TEN"
with Side Loader



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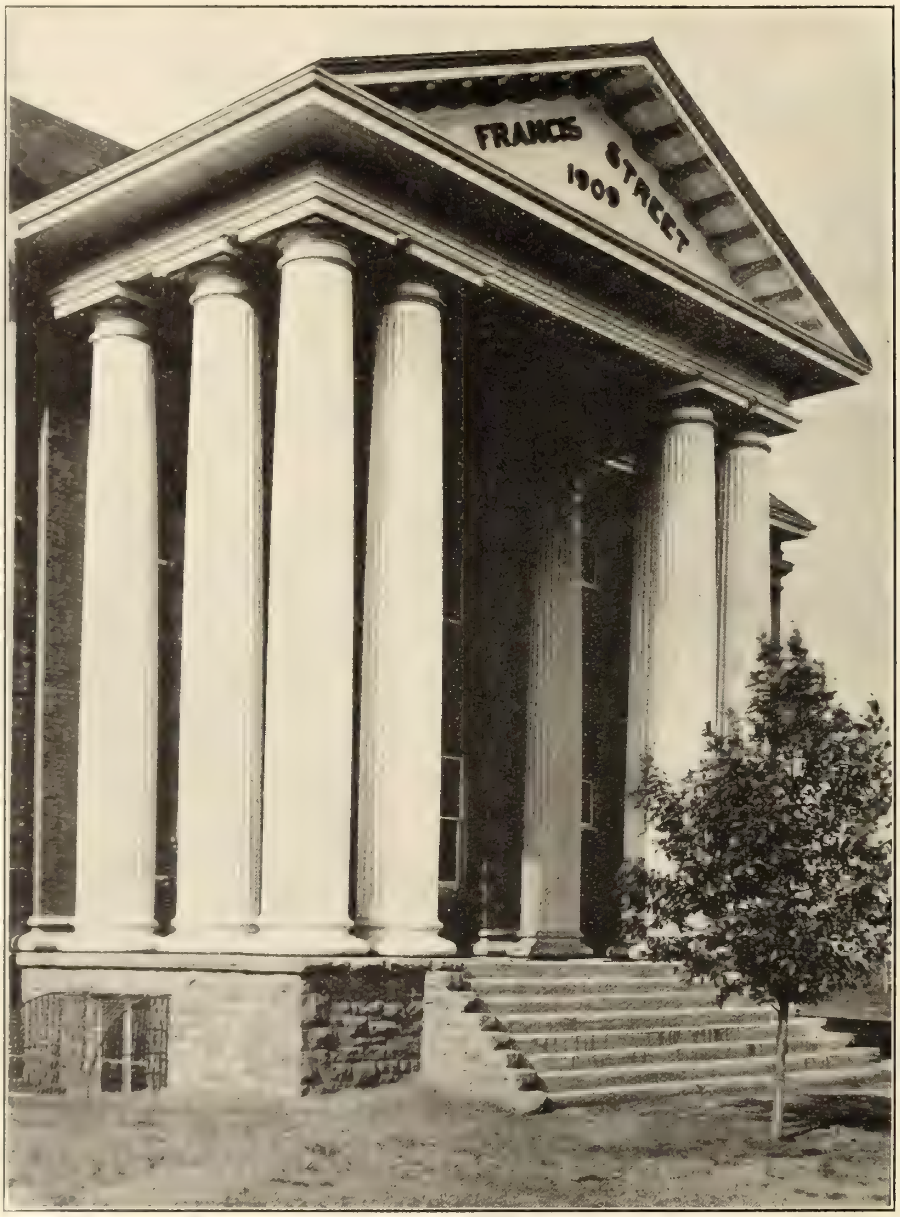

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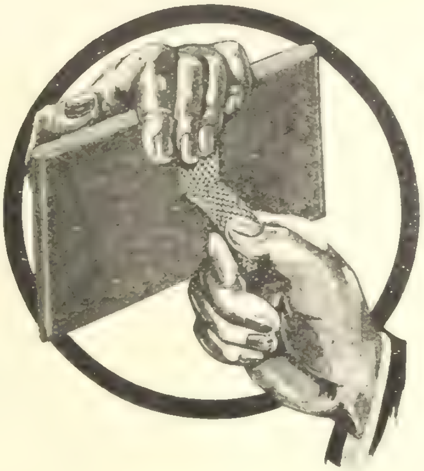

GOODYEAR

Try pulling this Belt apart

That will give you some idea of the enormous strength built into Goodyear Belts. Not an ounce of untested rubber is used, not a roll of untested duck. Each finished Belt is inspected before shipping *to make sure* that it will stand the *wear* and keep *pliable.*

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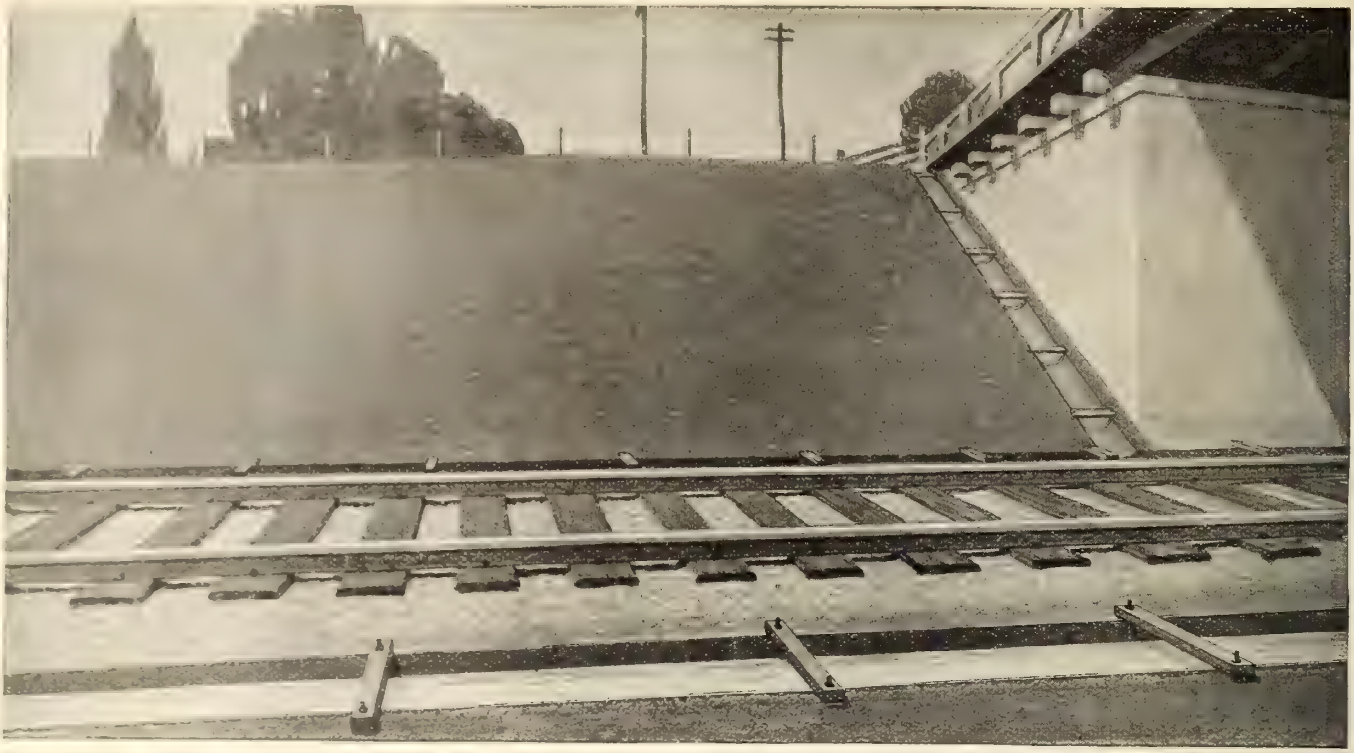

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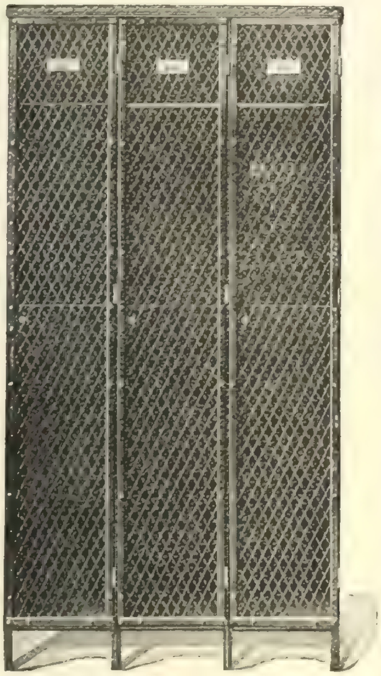

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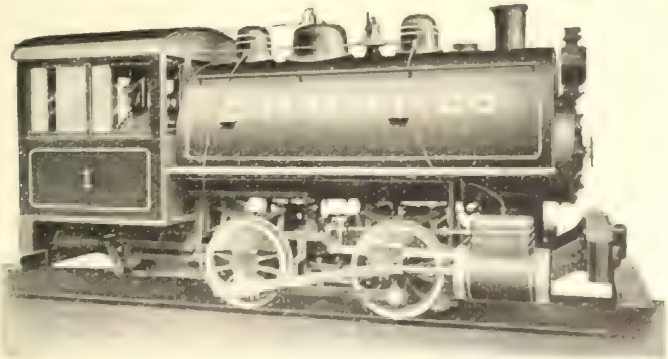

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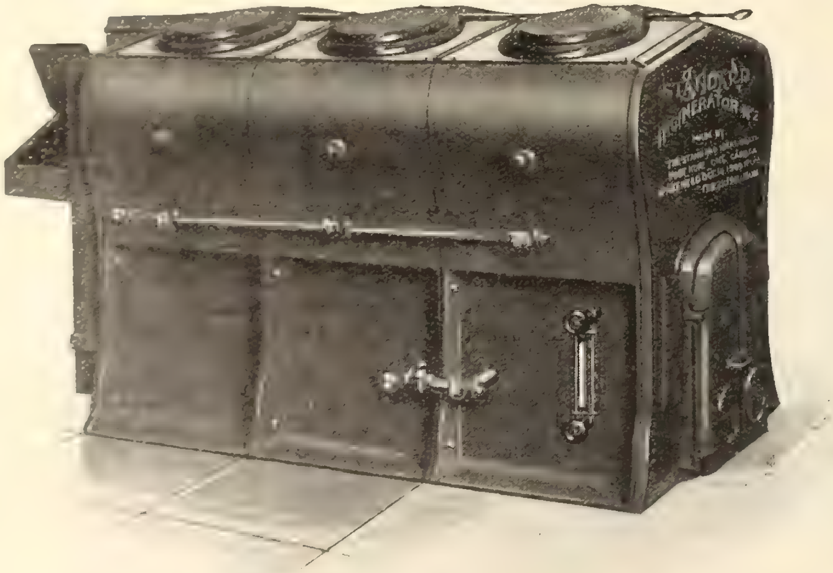

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Human Nature on Construction Work

PERHAPS in this day of competition when attention is centered first on getting the job and then upon carrying it through as expeditiously as possible at the lowest cost, adequate consideration is not given to the science of manipulating human nature. Pages have been written about scientific management, motion study and the like, and possibly in the discussion of these twentieth century ideas there has been a tendency to overlook that solution to the problem of managing men successfully that has existed ever since the world began, namely, a knowledge of human nature.

It must not be assumed for one moment that we are opposed to that systematic control of labor which makes for order and efficiency. Such order is absolutely essential in this age of progress when requirements are so exacting and standards so high, but we do contend that in the more advanced phases of scientific management the principles adduced, put into effect, are likely to militate against the good of an undertaking, for the reason that no provision is made for the individuality of the workman—human nature is taken as a negligible quantity.

Holding these views, it is refreshing for us to find this matter the subject of a comprehensive paper delivered recently by Mr. C. H. Hollingsworth before the American Society of Engineering-Contractors. We had hoped to reproduce the paper in whole or in abstract in this journal, but find it too voluminous. We shall therefore confine ourselves to a brief editorial comment on points of special interest.

In the first place the contention is advanced that with all the discussion there has been around the main subject, and with all the improvement that has been effected in the business and equipment of the contractor during the last two decades, "little progress has been made in the art of getting work out of men," for the reason that "the improvers have failed to treat the improvees as human beings."

At first sight it may seem that the subject under discussion has little connection with dollars and cents—that it is utopian, unpractical. Such an impression, according to the author of the paper, is entirely erroneous. Mr. Hollingsworth has had a wide and varied experience as a construction engineer. Evidence of this is provided in his paper in which, apologizing for any shortcomings, he informs us that his notes were commenced in Ottawa, proceeded with for a time in Mexico and later in Buffalo, and completed in the back woods of the province of Quebec. Mr. Hollingsworth's connection with engineering and contracting work extends over a quarter of a century and he has had sufficient experience as a construction engineer to entitle him to consideration. This is what he says concerning the relation of dollars and cents to the subject in hand: "There are more dividends to the square foot in this human nature proposition than in any other department of the contracting business."

In all contracting operations there is still, most certainly, "the unknown quantity represented by x" and many a large contract has been made or marred by the disposition of the laborers at some critical time.

Mr. Hollingsworth hits a vital point in his remarks concerning the supervision of contracting operations when he says that the class of superintendents which may be regarded as the head of the contracting business consists of men with engineering training, who, after coming out of college, don overalls and start in at the bottom. Undoubtedly, there is incalculable benefit to be derived from knowing how to do the practical work as well as the theoretical, for theory applied imperfectly in practice is a failure. Moreover, if one's work is bound up in the handling of men, it is worth while mixing with them to some degree with a view to understanding them. The author refers to "many hardy young college graduates who are in the thick of the flying dirt" and refers particularly to one who rose on a large contract first from pump man to concrete foreman and then to assistant superintendent. Before that he had put in about two years as rod-man and transit-man and all this experience was obtained in three years. Such experience at the outset of one's career is certainly worth while.

The ability to get the maximum work out of the men with the minimum effort and friction is born in a man, it is contended, and in many cases it amounts to genius. Such aptitude, however, cannot be developed to an appreciable value without adequate training. The superintendent of the ideal type must be a man who commands respect and obedience, who is well posted in both the theory and practice of his work, an enthusiast, a worker—and a man withal.

Mr. Hollingsworth's paper covers a great many points worthy of note. He comments upon the importance of acting squarely with the men in every little detail, particularly in regard to promises of increased wages, extra work and so on. One good point that he makes is that it is unwise to depreciate the value of a man's services after he has taken another position. "When you have a good man and someone wants to know about him, give him a boost," urges the author. "In the long run you will keep more men that way than by giving them a bad name. If you say that a man [illegible] no good anyway' after he leaves you, it shows poor judgment on your part for keeping him so long and then letting him leave finally."[*]

Public Comfort Stations

CANADIAN cities are woefully behind in the provision of public conveniences. There is a growing complaint in this country regarding the lack of such conveniences, of which our progressive municipalities would be well advised to take some account. European countries are far ahead of Canada in this respect, and in spite of our much vaunted progress it would often come as a shock to us if we knew the impressions that this defect in our municipal planning made upon the minds of foreigners. Why should not our cities follow the example of London, where such stations are distributed throughout all the crowded localities? There, the majority of the structures are built underground, in order to economize space. The average Londoner, who is ignorant of our shortcomings in this respect, would find it difficult to believe that in a city the size of Toronto, for instance, these stations can be counted on less than one hand. It is all very well to urge that the plumbing equipment and sanitary interiors of our public buildings vie with anything that can be seen abroad, but surely on this account it is all the more incumbent upon the municipalities to shoulder their responsibility. It is difficult to understand why this public necessity does not create a strong public demand.

These observations serve to introduce a copious extract from a paper by Dr. W. P. Gerhard, C.E., devoted to a general consideration of the requirements of public comfort stations in regard to location, design and construction. It might well be urged that action should be taken towards securing in all cities laws to provide public conveniences and to have municipal finance committees arrange for the erection of a sufficient number each year until every town and city were adequately equipped.

Location

First, as to location. Common sense determines that structures of this kind should be placed where people congregate in large numbers, and where they accordingly would prove to be of greatest service. Therefore, select in the city plan the points where main arteries of traffic intersect, take the street railroad transfer corners, the market places, railroad stations, the public parks and gardens. The municipality might properly erect them in connection with some of the public buildings, like city halls and court houses, police and fire stations, public schools, etc., but in such cases the stations ought to be planned with independent entrances directly from the street. In cities the street plan of which includes diagonal streets or avenues, one would generally have no difficulty in finding smaller open triangular spaces which could be appropriated for this purpose. These would form almost ideal sites, particularly in the crowded city districts.

In selecting suitable locations, the possible objections of mercantile establishments should not be overlooked, and there are likewise other situations where property owners will rightfully or reasonably claim that a public comfort station might cause a depreciation in property value. Prejudices of a similar nature may and will arise, this or the other objection to even the best scheme will always be brought forth and these will have to be firmly and judiciously met.

Public comfort stations may be built either above ground or else underground. From a sanitary point of view, stations above ground are decidedly superior, as they are more exposed to the beneficial effects of direct air and plenty of sunlight, and affording space for the heating apparatus and access to the waste and water service piping systems.

But in congested city districts the space above ground cannot always be secured, and while the difficulties of good ventilation and efficient sewerage may increase—as witness some of the toilet rooms in the deeper sections of the New York subway, where the sewage has to be lifted by ejector systems, and where some of the plumbing or sewage apparatus seems to be almost continually out of order—they are not any more insurmountable than the often required waterproofing of the walls to prevent undue dampness. These requirements may cause an increased expense, but no serious difficulty in the matter of sanitation exists.

Personally, we give preference, for various reasons, to a station built above ground. We consider that it is a good plan to make such buildings in pavilion form, and large enough to include other public conveniences, such as, for instance, a newspaper and magazine stand, a boot-blacking room, a cigar and soda water stand, a telephone room, including business and city directory, a parcel checking station. Built not unlike a park shelter house, a comfort station may be combined with a trolley line waiting room, of which successful modern examples exist in Europe. There may also be provided a small police-call station, and possibly a room for emergency or accident cases.

The services of an attendant on both the male and female sides are absolutely required, to keep the places clean and sanitary, and also to prevent abuses, theft of parts of the equipment, and generally to reduce the cost of repairs. Provision for attendants should therefore always be made in the plan.

There are those who claim that underground stations are preferable because such structures should be placed where they would be entirely "out of sight." This certainly appears to us to be an extreme view of mock modesty. We rather claim that there can be nothing unsightly or objectionable in a station built above ground, for the structure can and should be artistically built and effectively embellished by the planting of shrubbery and flowers around it. Some of the recent German stations seemed to us to be models in this respect, and proved beyond the shadow of a doubt that the exteriors can be made unobtrusive yet withal attractive and pleasing in design.

Design of Approaches

Particular attention should be paid to the designing of the approaches to underground stations. There should be provision for ample and easy stairways. The entrances for men and women should be as far apart from each other as possible, and if practicable not visible one from the other.

Underground stations require efficient ventilation, and at times some difficulty may arise as to the proper outlets for the foul air flues, but usually the ventilating flues can be designed as ornamental towers, and these may be utilized for street clocks—another public utility—or for ornamental lamp posts or candelabras.

The plan of a comfort station always embraces two distinct and separate sections, one for men and the other for women. The rooms should be planned as simple as possible, with wide passageways in order to avoid congestion. Back-to-back rows of plumbing fixtures are not to be recommended; it is preferable to locate the fixtures along the outer walls. In this way all parts of the room remain visible to the attendant. Where the urinal stands and the water closet compartments must necessarily stand in parallel rows, plenty of passageway should be provided between them, especially where the water closets have doors opening outward.

Some stations contain, in addition to the fixtures for free general use, a smaller number of pay toilet rooms, which, as a rule, show a superior style of fitting up, and include such conveniences as mirrors, brush and soap. These pay compartments secure greater privacy in use and afford greater cleanliness in the fixtures. The character of the city district in which the station is located should be carefully taken into consideration in deciding whether or not to provide pay compartments. It is an established fact that in some cases they have been found to be utterly useless, and were given up after a trial and changed to public fixtures. In other cases, on the other hand, they are found to be well patronized and considered to be desirable, because they help to bear the expense of maintenance of the stations.

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[*] Mr. Hollingsworth's paper will be reproduced in full in an early issue of the Journal of The American Society of Engineering-Contractors.

Sanitary Provisions

In order to secure proper maintenance, the construction and equipment of the building should be as sanitary as it is possible to make it. The whole interior should appear spotlessly white. Floors, walls and ceilings should be finished in light colors and with materials which are known to be nonabsorbent and readily cleanable. Nothing would seem to be better for this purpose than white glazed tiling, in connection with white enamelled porcelain ironware, or still better, solid white porcelain ware for the fixtures. No woodwork should be used except for the doors (and even these are sometimes omitted). The floors should always be well drained, so that the entire place can be kept clean by the attendants by turning on the hose daily.

The men's room should contain water closets, urinals, some lavatories and a slop sink; the women's side water closets, lavatories and a slop sink. The latter fixture is an important aid to the attendant in maintaining cleanly conditions in a comfort station.

A station for the accommodation of a city district of 250,000 people should have on the men's side about 10 water closets, 15 to 20 urinals and 3 lavatories. A sanitary drinking fountain on the modern "bubble type" proves a welcome addition, chiefly in summer time. The women's side should contain in addition to the fixtures mentioned a glazed porcelain receptacle for the reception of soiled sanitary napkins. A small supply room on the women's side should contain the supplies of soap, toilet paper, sanitary napkins and towels. The new type of paper towels and the liquid or granulated soap have much to recommend them.

Proper ventilation is essential and readily accomplished in the stations located above ground. Underground stations require a mechanical ventilating system to prevent them from becoming damp and foul-smelling. Both the lighting and the ventilation of underground systems become more difficult and costly than where the stations are built above ground. Ventilation is readily accomplished by means of electrically driven exhaust fans where the electric current is available. Each comfort station should have two shafts extended to the outer air, one for supplying pure air, the other to serve as exhaust shaft for the foul air. These shafts may be finished externally in an artistic manner as already indicated.

Poorly equipped or ill-cared for comfort stations are very objectionable in respect to ventilation. In winter time, comfort stations should be heated, preferably by steam. The air introduced by the ventilating fan may be warmed by passing over steam pipe coils or heating stacks. There should be in addition some direct radiation of heat to warm the place and to prevent the freezing up of the plumbing pipes in zero weather, though not much coal is required for this purpose, as the temperature need not be kept above 65 degrees Fahrenheit.

We shall not attempt to discuss in detail the matter of plumbing installations for comfort stations. Suffice it to say that only the strongest quality and most sanitary type of fixtures should be used. The entire installation and equipment must be sanitarily designed. Pure white fixtures, without any objectionable embossing, and pure white surroundings create a sense of decency, and thus help to induce habits of cleanliness.

Range or trough closets should never be used. The closets should consist of individual bowls, which may be flushed automatically by seat action. Automatic intermittent flushing cisterns lead to an inexcusable waste of water. The drawback of seat-action flushing mechanism is that it is liable to get out of order. As much of the mechanism as possible should therefore be hidden from and inaccessible to the user, and only under the attendant's control. In these places the fixtures are subject to rough usage and to much abuse. They should therefore be strong, durable and substantial. Detachable fittings are too liable to be stolen.

If the places are well heated, porcelain-top closets may be used. In many cases the crescent-shaped sanitary seats, which have the front of the woodwork cut out, have given good satisfaction.

For the lavatories hot water is desirable, but not essential. For the slop sinks hot water is almost a necessity, particularly for the scrubbing and the cleaning. Brass faucets should always be of the self-closing waste-preventing type.

The success of public comfort stations depends largely upon the care devoted to their maintenance. Just as soon as sanitary care and maintenance of cleanly conditions become neglected, just so soon will the comfort stations fall into disrepute, and cause a general failure of the good intent of such public utilities. The stations must therefore always be placed in charge of trustworthy and diligent attendants who are willing to work. The place of attendants should not be made a sinecure for political heelers. While the operating expenses are thus increased it may, on the other hand, help to decrease the annual cost of repairs. Public stations without proper attendants should never be contemplated.

The revenues which may be obtained from such stations will help to pay for their maintenance. These revenues are not only the fees from the pay compartments and the pay for soap and towels, but also the rentals from the special privileges and concessions suggested heretofore, such as bootblacking and news-stands, umbrella renting stands, theatre ticket selling, etc.

The stations should be open at least fifteen hours each day; some are kept open day and night. Loitering should be prohibited, and defacing of the building punished as a heavy offense.

The cost involved in the construction and operation of such structures should be considered in the municipal budget as a legitimate expenditure in the interests of the health of the city. Small stations have been built for from $5,000 to $10,000, but the larger ones, required in the big cities, cost if underground from $20,000 to $25,000. In a few cases private firms or corporations have sought the privilege of erecting such buildings on public squares or sites, but this is not to be encouraged, as the establishment of comfort stations is a sanitary measure to be inaugurated by municipalities and to be controlled by their health departments.

A party of C. P. R. engineers are at present busily engaged in the final examination of the located line of the Kootenay Central branch of the C. P. R., which for several years has been working its way towards Invermere from both ends of the Kootenay-Columbia Rivers valley. It is anticipated that very shortly the work of closing up the final link between the two ends, at which construction is now being carried on, approximately a distance of [illegible] miles, will be started. Contracts amounting to [illegible] have already been awarded for this work.

Construction of the Wawaitan Falls Power Plant and the Difficulties Encountered

By Robert Laird,[*] Toronto

WAWAITAN Falls, on the Matagami River, are about eighteen miles southwesterly from the "Porcupine" gold camp. The fall consists of a series of rapids—where the river, in its northerly running course, flows in a great elbow bend for a distance of nearly two miles. The total fall, before the improvement, was about 110 ft. It is now 118 feet from still-water to still-water. The minimum flow, as determined by gauge, was found to be 400 cubic feet per second and the period of lowest water was from about the 1st to the 25th of April. The power improvement works cut across this bend and have a total length of a mile and a quarter.

The plant consists of a concrete dam, a canal in rock, headgates, a steel penstock and surge tank, a reinforced concrete power house, a race and a 24-mile single line transmission line. The concrete dam is 1,000 feet in length, 750 feet of which is of the solid retaining wall type whose average height does not exceed 8 feet, as the dam is, in part, built on a rock island in the river channel and the shores are of rock and are abrupt. The main, or easterly, river bed is about 150 feet in width and the dam there has a maximum height of 22 feet. The westerly river bed is about 100 feet in width and the maximum height of dam there is 12 feet. The portions of the dam closing the river beds are of the pier and sluiceway type, wooden stop logs being used. The spillway is 150 feet in width and is immediately west of the westerly river bed. It is furnished with flash-boards. The original water level of the river, above the dam, is raised 5 feet for a distance of about 22 miles and now has an average width of one quarter of a mile. At the head of this stretch a further lakelet extends for 29 miles. This could be made a storage basin at small cost if such were found necessary. The canal in rock is 45 feet in width, has an average depth of 20 feet, and is about 2,000 feet in length.

Headgates and Penstock

The headgates are of concrete and are contained within the rock canal at its northerly, or inland, end and enclose the southerly ends of two 12-foot steel penstocks, only one of which is completed. The second will afford a duplicate system when the demands of the future warrant. Steel gates and stop log checks are also in position here, the gates being up stream of the stop log checks. No special provision for ventilation of the penstock is here attempted as the same is nearly level until it delivers into an amply ventilated surge tank. The penstock is 12 feet in diameter and 1,800 feet in length and is built in the usual stove-pipe fashion. It terminates in a steel surge tank 40 feet in diameter and 35 feet in height, with steel roof and floor. The penstock has a fall of 4 feet in this length and is laid in a trench, cut through sand, of average depth of 10 feet. The bottom of the 12-foot pipe is 4½ feet above the floor of the tank where it joins the same.

The surge tank is set back about 150 feet from the crest of the hill overlooking the river. Two 8-foot diameter steel pipes leave the tank (their bottoms being 6 inches above its floor) and lead to two Allis-Chalmers water wheels. They have a maximum grade of 13 per cent. and about midway they are anchored to a rock outcrop. Each has an expansion joint about 70 feet from the wheels with an anchor block near same and an additional thrust block just in front of the valves. A bursting valve of the hinge type is placed on each pipe between the expansion joint and the thrust block. The main valves (8 ft. diam.) are of the butterfly type and are controlled automatically. These pipes are placed 10½ feet centre to centre until they pass the expansion joints where they separate by "S" bends and enter the power house 20 feet apart. They are laid in a trench, averaging 6 feet in depth, cut in sand. Throughout all the above trenching the pipes rest on 8 inch x 12 inch sleepers, the full width of the trench in length, and 4 feet centre to centre.

Power House

The power house is a reinforced concrete structure with steel frame and trusses supporting the roof. It is equipped with a 4-ton crane, 45 foot span. The main part is 45 feet x 68 feet x 32 feet in height, with a 12 foot x 68 foot extension, 18 feet in height and with a tower for outgoing wires, cells, lightning arresters, etc. All fittings, windows, doors, etc., are of iron. The power house contains the two water wheels, two 2500 kilowatt generators, two exciters, switch boards, boards, etc. The draught tubes are formed in concrete, those of the exciters being iron, and deliver through a side gallery into the race.

The Tailrace

The tailrace is 100 feet in width. After leaving the power house it averages 15 feet in depth. It was excavated partly in rock and partly in earth. That part of the race within the power house is 22 feet in width and has an arched roof 10 feet above water.

If the following requirements made by the Government when granting the lease for this improvement, are kept in mind, one will better appreciate the effects of altogether unexpected difficulties. Had these been known in time it would have totally altered the method of the work. But the time limits left no alternative, for when those difficulties were met it was then too late to change. These requirements were a substantial beginning made by September 21st; completion by May 21st following. It was not expected that the limiting time for completion would be deemed a forfeiture in the event of the work not being wholly done, but an officer of the Government inspected in September and intimated that a very fair approximation to completion would be demanded in May.

The T. & N. O. Railway were constructing a spur line towards Porcupine and as soon as the steel reached Golden City in the month of July the first consignment of the Improvement Company's supplies and outfit were delivered there. These were hauled along an unimproved trail, cut and used by the Hollinger Mining Company during the previous winter, for a distance of about twelve miles to the Matagami River. This haul was of course anticipated and was in great part the deciding factor in the selection of the plant to be used on the work.

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Difficulties Encountered

The tales of woe of this road have whiled away many a winter's evening. The shattered waggon, the upside-down boiler, the sink-hole, the broken bridge, the miles of corduroy, the shifting of headquarters as the steel advanced, and the new cut road—each has its tales and its particular profanities. But they are past and almost forgotten.

A gasoline launch, two pointers and a scow had been forwarded to the river during the previous winter and used to make the run to the falls, a distance upstream of about 22 miles. This at the beginning was easy, but later, when the Sandy Falls Company were compelled to let the water off in order to make some changes in their layout, things were quite different. Rocks and rapids, shallows and pump filling sands made their appearance and that, too, when things were busiest. The river fleet now consisted of three launches, each one more unreliable than the other—as is usually the case when continuous haul at top power is asked of that type of engine. Three scows, 45 feet x 15 feet, had also been built and worked well while the water was high, but later the tale of woe of the all-day and all-night shepherding of them through rapids, the polling, the pushing and the wading with a temperature down close to freezing was quite a different story. The road, too, at the falls had grown from three-quarters of a mile to one of over two miles in length. Its character was changed, at first nearly level; now it had to pass up, over and down a hill 90 feet in height. In the meantime the work of building camps, clearing the pipe line of trees and the building of a coffer-dam had been pushed, so that when the inspector arrived things looked promising.

The first shock came when soundings were made at the site of the power house. A pit had been ordered dug to rock, shown on the profile to be 4 feet under earth. At about 3 feet, water was struck, and the foreman reported that he could not find rock with a crowbar. A longer rod was tried; then the longest in stock, 17 feet; still no bottom—and the bottom at that point has never been found.

Considering the matter afterwards and keeping in mind the facts that the whole area was water saturated and that the soundings were taken probably less than a month after the winter's snow had left the woods, it is likely that what was supposed to be rock was nothing but ice or frozen ground. A rock outcrop near at had was also deceptive. Careful soundings disclosed the fact that a narrow hogs-back of rock, about 200 feet wide, existed at a point about 250 feet further inland and upon this it was decided to build the power house. Fortunately, this rock rose to an elevation of about 3 feet above the water level of the river in front of it, but was covered by 10 feet of water-saturated earth. It was therefore necessary to drain this by a ditch 400 feet long and 10 feet deep to river level, before excavation could be begun. The digging of this ditch disclosed the first indications of trouble. Overnight a deposit, 4 inches to 6 inches in depth and 50 feet in length, was formed upon the previous day's work. This was hard enough to require the use of the pick. Quick sand, or travelling sand at the least, was anticipated in the low-lying areas, and such proved the case. This sand was so fine that it flowed with the water wherever water could go, and even in the extremely cold weather it issued along with the water from springs and flowed out upon the surrounding ice and made that almost indistinguishable from a deposit made wholly of sand. The excavation for the power house was begun, using slush scrapers. In the prosecution of this work the first essential was to keep the earth dry, for a wet or water-laden part soon worked up into a bog under the horses' feet, but was solid and workable when dry. A peculiar condition was noticed—after the sands had travelled—and though still under water—they formed into a compact deposit on which the horses could walk without sinking and indeed into which it was difficult to drive a wooden stake. A further difficulty was encountered in the things that the sands had covered and preserved in the years—logs as sound as when they fell, and tree stumps, with even the bark preserved, and some of them standing 6 feet high still rooted firmly amongst the rock crevices. The devices employed in the endeavour to overcome these were many. It was found best to work around the stumps until the excavation came close to the roots, when a pit was dug and the axe and the powder-man did the rest.

Of course, hurry calls for a derrick had been sent on the first signs of trouble, but there were hurry calls for other things—that for food enough for three hundred men being no small one. At last, however, a boiler and hoist, the irons and cable arrived. In the meantime the boom, logs and other timbers were cut in the woods and hauled to the site and the carpenters put to work upon them night and day.

The consoling thought had been that conditions would improve fine, when we reached the dry sand on the hill. One of the assumptions was soon found to be wrong—it was not dry. The other was underestimated—it was fine, but far finer than desired, and proved again to be the trouble-maker. The excavation in earth for the headworks disclosed water-saturated soil at a depth of 3 feet, and as the earth overburden to rock averaged 10 feet, we quickly realized our difficulty. An offtake ditch was dug to a nearby ravine. The tale of that ditch is disheartening. Every inch of its 600 feet length, bottom and sides, was polled to keep the sand out of it and it had done its work for less than a month when the cold weather set in and froze it solid. Pumping was resorted to, and succeeded.

The trench for the 8-ft. pipe and about five hundred feet of that for the 12-ft. pipe presented no difficulty, but the remaining one thousand five hundred feet has its story. The trench had been opened, dug at several points to grade and then allowed to fill with water and left until such time as the excavation should be brought forward from the hill face and so secure drainage. When the work did reach them they were nearly 2 ft. above grade. This led to a careful investigation and it was found that in many places the trench had narrowed more than a foot and at one point nearly 2½ ft. in its width at the bottom. What was happening was that the weight on the sides was pressing in the wet material near the bottom and also bulging the bottom upward. The material of the bottom was of the consistency of putty. As one walked on it he sank quite perceptibly but did not break through the surface: one's footprints were a well-defined hollow surrounded by a little puffed-up, rounded ridge. The sensation was uncanny: one feared the next step might land in a place of no bottom, one had visions of disappearing but never did. Fortunately for the prosecution of the [illegible] snap made the whole thing solid as rock, but unfor tunately it also turned much of what remained into rock also rock that would not shatter as it should, when blown. Night and day shift kept ahead of the frost and in soft material, where the depth was considerable, but depths of a foot or less had to be removed by the pick. This night shift business with a temperature hovering about the 40 below zero mark and one's feet in water did not produce a cost sheet that one would show willingly. No-one boasted about it.

There is a great difference, you know, in his manner, when the Boss says, "Yes, I understand, you did remarkably well under the circumstances," from his manner when he says, "Under the estimate. That's good." The latter circumstance sometimes leads to a bonus, though the former more often deserves it.

The last unusual fact of the time limit that will be mentioned is the pouring of cement at low temperatures. This was of small concern in the case of solid work, anchor blocks, foundations, etc., that could be kept covered and heated by stoves, but the thin 6 in. walls standing exposed for a height of thirty feet and more above the ground was quite a different matter. Warm water was kept on hand, and the gravel heated. The thermometer was watched and when it rose to ten above zero, and seemed likely to stay so for an hour or more, pouring was done. The cement froze, of course, and remained frozen for months, but it seemed none the worse for that, though not so smooth and neat in surface as would have been the case had the carpenters been more comfortable while setting the forms.

There was one unusual feature of the prosecution of this work that deserves mention. A complete fabricating plant, an iron shed, 40 ft. x 100 ft., containing boilers, compressors, punches, shears and rolls, was erected on the ground twenty-four miles in a direct line from the nearest railroad, and there the whole steel work was made. The reason for this was the difficulty of handling, because of their weight and size, lengths of the pipe over the trails—to say nothing of the space they would have occupied on the scows.

The plates arrived in the condition they left the steel works, were punched, rolled, assembled into 15 ft. lengths, painted, and handled by derricks and hoist from the shed on to a large sled in the trench. They were hauled to place by cable and hoist and rivetted to that already set. Owing to the frozen condition of the earth and water not being available to test the pipes, it was not possible to cover them as should have been done at once. This brought to notice the great effects of expansion and contraction.

It was observed that the roof of the surge tank appeared to be warped at times. Examination showed that the pipes in their motion were pulling or pushing the tank. The steel floor, close to which they were placed being rigid, threw the whole force upon the walls and the resulting action was not unlike that of the opening and closing of a pair of compasses—with the added danger to those parts of the tank walls close to the joints through short often repeated bending. The collar of the 12 ft. pipe was therefore freed and allowed to slip freely back and forth on the pipe. Watchmen were assigned to see that the parts, if they separated during the night, were properly entered again when expansion made that possible. Failing to do so one morning, the collar was caught at one point and the ½ in. steel of which it is made was crumpled like a piece of tin.

The force exerted was perhaps better illustrated by the motion given by the 8-ft. pipes to the tank—a structure of steel 40 ft. in diameter, 35 feet in height and weighing about 70 tons. It was found that the tank was being pushed bodily over its foundations often as much as 7½ in. during the morning and drawn back again at night.

Evolution, Eternal Evolution

IN the world of manufacture and commerce there is a constant and relentless warfare carried on between two contending forces. One tearing down, the other building up; one pointing out the weaknesses, the other trying to strengthen the defences; one destructive, the other constructive; and the resultant of these two forces is the material progress and prosperity we enjoy.

The manufacturer of safes designs them to resist the methods then known to the safe-robber. But the resistance so offered sharpens the wits of the burglar, and he devises a new way of opening the new safe. Immediately the manufacturer strengthens the weaknesses so disclosed, and the burglar is temporarily at a disadvantage until he finds a new way to overcome the latest defence. And so the war goes merrily on, each in his way contributing to the perfection of the safe.

Again, in the science of warfare a gun is built which will pierce the sides of a wooden-hull ship. Immediately a steel armor is provided which the guns can not pierce. But when the resistance is known, the force required to overcome that resistance can be easily calculated, and larger, stronger guns with larger charges of more powerful explosives take the place of the weaker piece, and the armored ship joins the ranks of the second-class fighters being subsequently consigned to the scrap-pile.

So it is in every branch of the building arts. What is new to-day is old to-morrow; and our most advanced and approved methods seldom last more than a decade. A particularly large or intense fire shows some weakness in the fireproofing methods used, and immediately that weakness is strengthened, and the system adopted until some subsequent conflagration points out some better method that can be used; and thus the conflict goes eternally on between the genius of man and the element fire.

In the building of a large power house for a street railway company in New York City, steam-engines of the very best type were specified and ordered. But before the building could be finished, the steam turbine had so completely proven its supremacy that the building was altered to provide for this latest and most modern steam prime mover.

Such are some of the changes and the rapidity with which they are brought about. The automobile of to-day is vastly different—and better—than that of a few years ago. Aerial navigation and wireless electricity are modifying all our ideas and structures to-day, and so it will be until time ends and eternity begins; there will be no cessation from activity only where there is death and decay.

The Best Construction at All Times

The lesson we learn from this is that we must build to the best of our ability at all times, doing our duty as we see it in the light of past experience, and let the future take care of itself. If we fail to adopt and use the best at our command, progress will be checked; for it is only by exposing to the test of experience that we can find the strong and weak points of any system, and having found, improve on them.

We are philosophizing on things in general because all methods, systems, or appliances follow this same law, and in the world of building we have heard the soundness of the law questioned. Some doubting Thomases have raised the point of whether it pays to fireproof buildings because methods of fireproofing are improving annually, and we have not reached the state of absolute perfection yet. They point out that methods which were considered perfectly safe and satisfactory twenty years ago would be of small use in a modern sky-scraper. But what they fail to see is that there is not only a change in the fireproofing methods, but likewise in the type of building. We, like the safe manufacturers and the battle-ship builders, must of necessity build for the service required. Twenty years ago a twelve-storey building was considered tall. We spread out then where we go high now. The average business building of that time was perhaps five storeys in height; and what would be perfectly suitable for buildings of that character would be hopelessly inadequate for a fifty-five-storey building of the present. Had the type of building not changed, chances are the methods of fireproofing would have altered but little, for what was satisfactory in the past would have proven equally satisfactory to-day. But evolution, eternal evolution, is the law of industry and nature, and as the type of building evolves, the structural details must change in harmony with it. That is simply adapting the organism to the environment, or survival of the fittest.

The method of fireproofing now in use are the best that experience, experiment, judgment and resource can supply. We must use them whether we want to or not, for there is nothing more satisfactory to be had. If we reject the best of our time because we believe some better method will develop in the future, we shall have to put off building until that time comes or go back to the past, using methods already out of date and discarded. Such a course would be foolish in the extreme, and an idea or action worthy only of a "borderland dweller."

The world has made rapid progress during the past fifty years. A glance backward will show that practically all progress made in heating, lighting, plumbing, electricity, steam engineering, building, railroading and various other lines has been made in that time. It will show still further that the progress was made by using each year the best methods in the various lines available; and that without following out that policy there would have been little or no progress made in that time.

It is to our interest to learn our lesson from the past, and apply that lesson to the present. This we can not do if we stop the wheels of progress until such time as we believe effort shall have caught up with perfection.—Building Progress.

Practical Methods for Obtaining High Efficiency in Waterworks Plants

By S. C. Pollard

EFFICIENCY and economy are not necessarily the same, although efficiency is essential to economy. Take two pumping engines, one a low duty machine capable of attaining a duty of 50,000,000 ft.-lbs., the other a high duty triple expansion engine capable of performing a duty of 150,000,000 ft.-lbs. Assume that in the first case an operating duty of 40,000,000 is obtained and that in the second case the operating duty is 120,000,000 ft.-lbs. The efficiency of operation based upon standard performance would be exactly the same in both cases, namely 80 per cent. On the other hand, the efficiency based upon energy expended or the economy of operation, would be three times as great in the case of the triple expansion engine. Now assume again that these engines are installed in a station close to a coal mine, where fuel is very cheap. In this case it is probable that on account of the lower cost of the first engine, involving lower fixed charges, it would be a more economical machine for the service than the more costly high duty engine which is three times as efficient.

The problem before the engineer may be that of designing and building an entirely new plant, that of adding to a station already constructed or that of establishing an efficient system of control and operation in an existing institution. When a new plant is to be built, careful consideration should be given to both fixed charges and operating costs. It is also necessary to make a careful study of present and probable future operating conditions. Due regard must be given such matters as the comparative cost of different types of engines, boilers, foundations, buildings, auxiliaries, etc. The cost of labor, fuel and supplies must be considered. The interest rate on loans, the efficiency and durability of the machinery, the load fluctuations, the character of the service, the probability of proper handling and many other things must be taken into account before a rational decision as to what will be the most economical plant can be made. Most of these considerations apply equally well in the choice of additional equipment, although other matters such as the space available, the character of the machinery already installed, the question of permanence of supply, the proposed addition of a water purification plant or the serious depreciation of the present plant, which will necessitate complete reconstruction in the near future and the amount of available funds may have a deciding influence.

Let us consider an ordinary every day pumping station such as is in most of our medium sized cities and in many of our larger ones. The buildings are possibly ornate, possibly extremely plain. They are not always practical. The engine room is fairly well equipped, the bright work and brass bands shine attractively, the floor is fairly clean, not much escaping steam is apparent, there are no cracked steam cylinders, the fly wheel is all there, a few records are kept and the engineer is apparently well satisfied with himself and the world in general. The boiler room is usually unattractive. It may be gloomy, dirty and repulsive. Possibly there is an unsightly junk pile in one corner, a dilapidated [illegible]

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[illegible] broken engine parts under the window. The sanitary arrangements consist of a greasy wash pail and a grimy cupboard. Such conditions are reflected in the employees. The fireman in a listless manner now and then fills the furnaces up with coal. He occasionally cleans the fires and takes out the ashes. Possibly more or less steam is escaping through a blown out joint, the heater may be stopped up, the damper will not work, the coal goes on the fire and "the smoke goes up the chimney just the same." Nobody from the manager down considers for a minute that there exists numerous preventable losses all along the line, which in the aggregate may amount to thousands of dollars annually.

To avoid such losses it is necessary, in the first place, to employ only efficient and intelligent labor. If the plant be a new one, one of the first requirements is the selection of an operating force. In most municipal plants the executive is spared this trouble. The employees are selected for him, either arbitrarily because of their effectiveness in their respective wards and precincts, or through the medium of a civil service board. The first method is bad because the qualifications are seldom taken into account. The second is often little better because the examining board is not acquainted with the character of work to be done and is therefore incompetent to judge of the fitness of the men. It does not eliminate political favoritism and the best qualified men, having no difficulty in getting employment, pay no attention to the examinations. Pre-eminently the person best equipped to select the operating force is the engineering executive. A great deal, of course, depends upon the proper selection of an executive and mistakes may be made, but if the responsibility is placed squarely upon him and he is held absolutely accountable for the results, he will usually either make good or voluntarily make way for some one else. Not one man should be employed without a careful examination into his qualifications and reliability and no discharges should be made except for just cause. Discipline should be strict and every man should be made to understand, at the time of his employment, that he must do his full duty and that he will be fairly and honorably treated. Confidence on the part of the man in the fairness of the executive is a tremendous incentive toward efficiency.

Operating Standards

The next important problem before the waterworks operator is the fixing of operating standards. Duty trials of engines and efficiency tests of boilers are or should be made shortly after the installation of this equipment. At the time of such tests the machinery is usually under the control of the experts employed by the builders and has been "tuned up" to the point of highest efficiency. The test records should be somewhat elaborate so as to cover all of the conditions under which the engines or boilers were operated. The city or water company should be represented by competent engineers who should see that all records are strictly accurate. Gages should at this time be tested and made to record correctly and indicator cards should be taken from the steam cylinders and filed with the records. Tests should, if possible, cover not only performances at full capacity, but at half and three-quarters capacity as well. The test records thus obtained should be carefully preserved in a readily accessible place, and should be adopted as efficiency standards for the future operation of the plant. Written instructions for the every day operation of the various engines and boilers should then be prepared by some competent person and the executive should insist that they be acted upon. The writer believes that in this way efficiencies approaching those of the official tests can be maintained over long periods of time.

If for any reason such efficiency trials have not been made or if the results are not available, a competent engineer may be employed to study the conditions existing in the plant, to make such tests as may be necessary or desirable and to establish efficiency standards and proper methods of handling the plant.

Maintenance of Equipment

To obtain satisfactory results it is necessary that each and every part of the equipment be maintained at all times in the best possible physical condition. In the first place, everything should be kept scrupulously clean. The operators themselves are not to be excused from this requirement. Dirt is a visible sign of inattention and where there is carelessness in this particular it generally permeates the whole station. The lawn should be well kept and a flower bed or two may be added. A picture or two, preferably of up-to-date waterworks machinery, hung on the engine room wall, a little paint where needed, a neat desk and chair for the engineer and an occasional word of encouragement all assist materially in increasing efficiency. It pays to provide modern sanitary arrangements, including wash room and bath. It pays to provide a light and well ventilated boiler room and to instruct the fireman in the principles of economical firing.

Having made the plant attractive to the men, the next thing is to see that the machinery is kept at its best. The following conditions which are not uncommon in the engine room have no right to exist:

1. Leaky throttle valves, allowing steam to waste through dead engines. 2. Leaky steam traps, allowing steam to waste continuously. 3. Leaky valves in small piping and bleeder valves carelessly or unnecessarily left open. 4. Steam leaks at pipe joints or from stuffing boxes. 5. Leaks around steam pistons, due to loose or worn rings. 6. Leaky steam or exhaust valves. 7. Leaky shut-off valves in steam pipe. 8. Jacket pressures carried too high or improperly regulated. 9. Steam valves improperly set. 10. Poor vacuum due to dirty condensers, air leaks or vacuum pump being out of repair. 11. Excess friction, particularly on pump plungers, because of tight or improper packing. 12. Improper lubrication. 13. Improperly adjusted bearings. 14. Slip and leakage around plungers or through pump valves. This is often the most serious loss in the engine room and in some cases tests have shown it to be as high as 30 per cent. and 40 per cent. The principal causes are worn plungers or packing, lack of valve area and too high speed. 15. Running engines under throttle when they should be operated under cutoff with throttle wide open. 16. Operating duplex pumps short stroke.

Sometimes there are structural defects which can be remedied at comparatively little cost. Such often cause serious losses. Hot water drainage goes to waste when it should be returned to the boilers. Oil is wasted because there is no means for recovering or filtering it. Steam cylinders, steam and hot water pipes are bare or the covering is of poor quality or insufficient thickness. There is a troublesome air pocket in the suction or an unnecessarily large supply pipe has been taken off the discharge main close to the pumps for feeding a railroad tank or street flusher. Air chambers are of insufficient capacity or improperly located, water hammer and imperfect filling of the pumps results. Suction pipes have numerous short bends or are laid without regard to grade. Possibly there is a whirlpool at the end of the suction pipe carrying air in the pumps. Perhaps the fly wheel "works loose" and frequent stops are made to drive the key. Why should these things be?

Losses Through Improper Firing

It is probably true that in the average plant the boiler room losses outweigh all others, the principal one being due to improper or unintelligent firing. In some cases the construction of the boiler plant is so defective that even with good firing satisfactory results can not be obtained. Very often the whole boiler plant has suffered from lack of care and things have gone to the bad to such an extent that efficient results can not be expected.

Boiler plants are occasionally constructed in a most haphazard and unscientific fashion. Stacks are too small or too low. Smoke connections are inadequate. The baffling is defective. The grate surface is too small to burn the coal properly. The heating surface is insufficient. The furnace may not be of suitable design for the fuel used. Usually air leaks into the setting through cracks or badly fitting doors.

When the upkeep of the plant is neglected there may be leaky rivets, joints and tube ends, leaky steam traps, leaks around water columns, at nozzles and safety valves, leaks through apparently closed valves into boilers not in use, leaks everywhere and in the most unexpected places. The feed pipe leaks, there are heavy deposits of soot on fire surfaces and scale on inside water surfaces, the blow-offs leak, the feed pump is out of order and the tubes in the heater are stopped up.

To return to the matter of firing. Professor Kent says:

There are some kinds of firing, practised by ignorant or negligent firemen, which any one who knows anything of the subject can say at once are wrong. Among these are: (1) Putting a large quantity of coal in the furnace at a time, covering the bed so thick that the air supply is choked, and incomplete combustion necessarily takes place. (2) Firing at irregular intervals and occasionally allowing the bed of coal to burn so low that a great excess of air passes through it. (3) Neglecting to cover the whole of the grate surface, and allowing holes to form in the bed of coal.

There are other errors of firing which are not evident on ordinary inspection, which may be practised by the most careful and intelligent firemen without any suspicion that they are wrong, and which can only be discovered by making a series of boiler tests or by an analysis of the chimney gases. Such errors are the carrying of a bed of coal either too thick or too thin for the size of coal and force of draft, and unskilled regulation of the draft.

The rational way to correct the errors just mentioned, permanently, is to make the necessary tests and analyses, correct the defects and standardize the conditions of operation. Automatic feed water regulators, recording gages, draft gages, flue gas thermometers, CO_2 recorders, Orsat apparatus, gage testers, indicators and the like are very useful and are necessary in making scientific investigations. With one or two exceptions such apparatus unless in competent and experienced hands will do little good.

The principal furnace loss is that due to too much air, furnace temperature being thereby reduced, and 15 per cent. to 25 per cent. of the heat of the fuel may in this way be unnecessarily discharged with the stack gases. Insufficient air supply is not uncommon. It is mainly due to defective draft and overcrowding the boilers. With irregular firing there are usually periods of insufficient air supply followed by periods of excess air with losses both ways.

Valve of Automatic Stokers

By all means the best method of increasing boiler efficiencies is the installation of automatic mechanical stokers. They eliminate to a very large extent the personal element and thus insure more uniform operation. The cost is about $5 per horse power and even in comparatively small plants the saving in fuel will pay a handsome profit on the investment. Even with stokers the operation should be in accordance with carefully determined methods and not guess work. Before leaving the subject of boiler operation, attention should be called to the fact that steam pressures should not vary and that the water level in the boilers should not be carried too high. The first causes loss of both boiler and engine efficiencies, while the latter produces wet steam, reduces efficiency and sometimes endangers the engine.

As far as possible, supplies should be standardized. Experience and study will determine the character of those best suited for each particular service. Specifications are desirable, but they should be very definite. It is not ordinarily necessary to purchase the highest priced goods, but exceptionally low prices should usually be viewed with suspicion. Contracts for coal should be made on a heat unit basis.

The care and use of supplies should be as carefully controlled as is their purchase. Suitable store rooms and cupboards painted throughout should be provided. There should be a definite place for everything and it should be kept there. Incoming stores should be carefully inspected and checked with the order and invoice. Outgoing stores should be measured or weighed. Standard quantities of waste, oil, etc., for a day's use may be determined and the stores issued accordingly. A complete running inventory covering everything in the store room is not difficult to keep.

Many things will suggest themselves to the economically inclined engineer. An oiling system in place of the hand regulated cups will save 50 per cent. to 75 per cent. of the engine oil, reduce the labor of cleaning 50 per cent. and eliminate hot journals altogether. A little piping, an oil separator and a filter may save 30 per cent. of the cylinder oil. Proper tools conveniently kept help to keep down the repair account.

Having selected a competent force of men, having remedied the structural defects and put everything in good repair, having determined the highest attainable efficiencies and conditions incident thereto and having prepared definite instructions for plant operation and put them in force, it is still necessary that accurate and detailed records be kept. Records are the connecting link between standards and actual practice and indicate at once the cause of reduced efficiency.

All steam, water, vacuum, receiver, jacket and other gages, engine counters, floats, etc., should be read, not glanced at, at frequent intervals, and the readings should be entered in a properly ruled book. They should also be recorded upon loose leaf report sheets for the superintendent. Automatic records from recording instruments should accompany the report. All coal and ash should be weighed and a record kept thereof. The duty of engines should be frequently cal-

[illegible] and any falling off be investigated and corrected.

Cost records should be kept at the main office. They should take into account not only cash expenditures, but the actual cost of maintaining the plant for definite periods of time, which is an entirely different matter. The records should carry enough detail to enable the superintendent to determine at once any variation from standards or unusual expense in the upkeep of any part of the machinery.

It is probable that the waterworks operator may consider the suggestions made in this paper as impractical, or that they will add to engineering and administrative expense or increase labor. The writer has proven many of them to be eminently practical, and that their adoption materially reduces cost of operation. Less labor is involved with intelligent, efficient operation than with careless, inefficient operation. There is less coal to be shovelled, less ash to be carted away, less oil to handle, less damage to machinery, less repair work to be done, less new machinery to be bought. The only increase involved is that of brain energy, the proper exercise of which makes better executives and better operatives.

Tests of Concrete T-Beams

In connection with the construction of two concrete buildings by the unit system a series of tests to determine the shearing strength of construction joints in the stems of reinforced concrete T-beams was conducted during 1912 under the direction of Prof. L. J. Johnson and Mr. John R. Nichols, of Harvard University, Cambridge, Mass. The methods employed in these tests and the results obtained were presented by the authors in a paper entitled "Shearing Strength of Construction Joints in Stems of Reinforced Concrete T-Beams as Shown by Tests," read before the American Society of Civil Engineers on April 2nd.

The specific objects of the tests were: First, to determine whether the type of construction going into the building, involving a corrugated joint between the stem and the slab, was safe; second, to determine whether it would be safe to dispense with the corrugation and use instead a smooth joint, that is, an ordinary untreated joint; third, to discover if possible how high a shearing stress such a smooth joint can resist. The corrugations consisted of trapezoid depressions 2¾ in. wide and ⅞ in. deep spaced 5 in. on centers. Special types of design were adopted to enable an intelligent consideration of these three conditions.

Beams of type "A" were designed for a study of the first two considerations and were similar to those used in the actual construction. While most of the failures of this type are ascribed to crushing of the concrete, in the opinion of the writer, the elastic limit of the steel was exceeded in all cases, which caused the neutral axis to rise, thus giving a diminished compression area and a higher unit compressive stress. In the beams of type "B," which were designed primarily for a study of the third consideration noted above, the primary cause of failure, according to the authors, was slipping of the main tension rods.

In conducting the tests no horizontal shear or slipping on the joint was observed. In fact, the authors state that the jointed beams, both smooth and corrugated, withstood the test as well as the monolithic. Moreover, there was no evidence that the joint contributed in any way to the failure of the beams, although the shearing stress on the joint reached values in excess of four times the 120 lb. per square inch allowed by the Joint Committee.

Conclusions

According to the authors, in view of the striking uniformity both in the general behavior of the beams during the test and in the numerical results obtained, the tests would seem to justify the following conclusions: First, that the type of construction used on the building in question was safe; second, that the joints did not need to be corrugated; third, that a smooth and unroughened joint constructed in the same manner as the joints tested, in a beam suitably reinforced for shear or diagonal tension, is capable of transmitting, with ample factor of safety, any shear that could safely be permitted in a monolithic beam of the same cross-section and having the same reinforcement.

Bearing on Engineering Practice

The authors state that it may be reasonably inferred from the results of these tests that in the ordinary monolithic floor construction where adequate web reinforcement is provided with sufficient anchorage at the top the slab need not be cast before the stems have set, although the contrary has hitherto been generally assumed. They recommend that until further tests are made care should be taken to see that the web reinforcement crossing the joint is sufficiently anchored both above and below and that the surface of the joint is clean and not too smooth.

Furthermore, it appears that the stem of a reinforced concrete T-beam may be reinforced so as to be capable of carrying an ultimate shearing stress of at least 888 lb. per square inch. The authors call attention to the fact that in the tests noted the really ultimate shearing strength was probably not obtained, as the shear was in no case the cause of failure.

The high values of unit shear obtained in these tests, together with the fact that the lowest value for the unit shear in any of the beams when the first diagonal crack was observed was about 185 lb. per square inch, indicate, in the opinion of the authors, that the 120 lb. per square inch, recommended by the Joint Committee, is low enough, provided the shear reinforcement is adequate. It should be noted that in these tests the concrete was not of exceptional richness nor otherwise of a quality better than used in ordinary building work.

A lecture on "Paving" was delivered by Mr. Peter Lyall at a recent meeting of the Royal Technical College Architectural Craftsmen's Society, Glasgow. Mr. Lyall said that several cities had paved streets before the Christian era. Nevertheless those which were at present the ornament of Europe (Rome excepted) were destitute of them till almost the twelfth or thirteenth centuries. The Carthaginians were the earliest road makers, and their example was copied by the Romans. Of modern cities the oldest pavement was commonly ascribed to Paris, but it was certain that Cordova, in Spain, was paved as early as the ninth century, and Paris about the twelfth century. Historians asserted that London was not paved in the eleventh century.

The Ready Calculation of Bridge Costs

Diagrams and Data for Easy and Rapid Determination of Cost of Concrete Highway Bridges of the Girder and Slab Types

By B. H. Piepmeier

THE purpose of this paper is to develop a ready means of ascertaining the approximate number of cubic yards of concrete in a completed structure of the through girder or slab type, of known span, height of abutments, and length of wings, as well as to develop a means of making preliminary estimates of the cost of completed structures without calculating the quantities in detail.

The bridge work of the Illinois Highway Commission requires a personal inspection of the bridge site with the local officials, and at this meeting the necessary data are obtained for the design of the bridge. Almost invariably the officials expect that an estimate of the cost of the proposed work will be given them at this time. Consequently, it is desirable to be prepared to give an estimate of the proposed bridge that will closely approximate the one that is made from the detailed drawings. This is usually a somewhat difficult matter unless time is taken to compute the number of cubic yards that will be in the bridge.

Before proceeding, it may be well first merely to outline in a general way the slab and the girder bridges as designed by the Illinois Highway Commission, and give a few dimensions, that you may better understand the types of bridges under consideration.

Slab Bridges—For reinforced abutments for slab bridges, the main wall is made 12 inches thick from top to bottom, the steel reinforcing being placed on the stream side, and the percentage of steel increased as the height increases. The abutments rest on an 18-in. reinforced footing, which is made of sufficient size to allow but 3,000 lbs. per square foot bearing on the foundation. When a soft foundation is encountered, this same size footing is usually sufficient to permit the proper spacing of the required number of piles.

The reinforced wings for slab bridges are of the standard cantilever type, the base being 33 per cent. of the total height. The wing wall proper is 12 in. thick for heights up to 16 ft. For greater heights, the base of the wall increases in proportion to the height. Nearly all wings for this type of bridge have a drop of 18 in. to 5 ft. at the end, to conform to the 2 to 1 slope on the sides of the road. I may say here that the cantilever type of wing for extreme heights has been found much more satisfactory than the buttress type, as the increased thickness at the base and the large percentage of steel do not equal the extra cost of forming necessary for the buttress type.

Reinforced concrete slab bridges are designed with various roadways ranging from 16 ft. upward. The side rails usually average 8 in. thick and 3½ ft. high. On this type of bridge the slab and the side rails come flush with the back of the abutment walls. The top of the wings comes up along the outside of the rails to catch the side slope on the road. In determining the thickness of the slab, its entire dead load is considered, the load of the cushion wearing surface, and a 24-ton engine live load. Excluding temperature stress, the steel is figured at 12,000 lbs. per square inch; the compression in the concrete is assumed at 800 lbs. per square inch.

Girder Bridges—For the reinforced abutments for girder bridges, the general type is the same as that for slab bridges, with the exception that all abutment walls proper are 18 in. thick, and the width of base for the wings is 40 per cent. of the total height. The extra thickness in the abutments is for bearing of the girders. The extra width of base under the wings is for stability, as the wing walls are cut away from the abutment walls proper by a 1 in. partition to allow for expansion of the superstructure. They can therefore receive no support from the slab bridges. The wings on this type of bridge also come up on the sides of the girders, and drop several feet at the ends to follow the general side slopes on the road.

The reinforced concrete girder superstructures are designed with roadways from 16 to 30 ft. The roadway usually required is 16 to 20 ft. The side girders average from 4 to 6 ft. in height, and 16 to 30 in wide on top. On the side girders they are heavy depressed panels to lighten the web and to give the proper appearance to the finished bridge. The floor-slab and side girders on this type of bridge also extend to the back side of the abutment wall. The floor-slab is designed to carry its own dead load, the cushion wearing surface, and a 24-ton engine live load. The side girders are designed to carry the entire dead load of the superstructure, plus a live load of 125 lbs. per square foot on the roadway, or a 24-ton engine, whichever gives the greater moment.

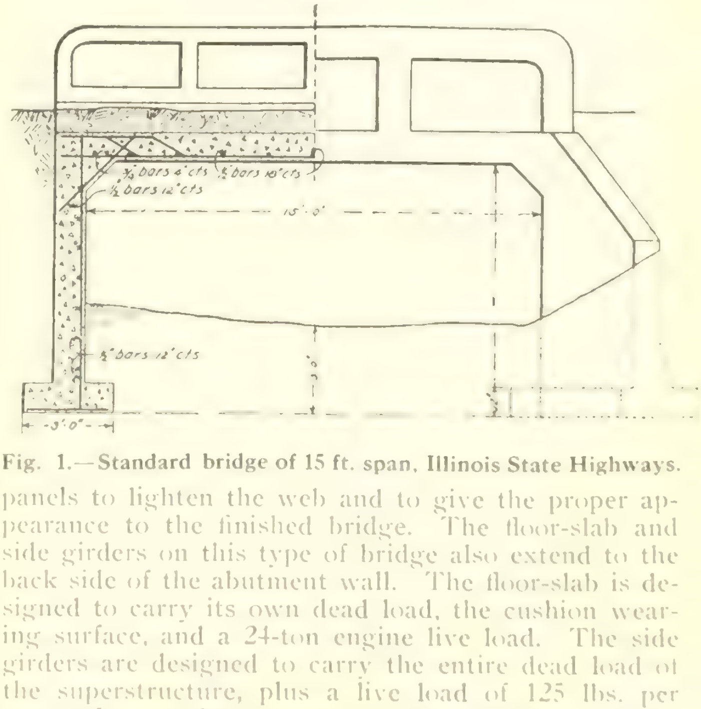

Fig. 1.—Standard bridge of 15 ft. span, Illinois State Highways.

Abutment Diagram—For the purpose of determining off-hand the approximate yardage in a pair of reinforced concrete abutments for either slab or girder bridges, Fig. 3 has been prepared, and is applicable within the specific cases used. For abutments of slab bridges, 40 different designs were taken from the files of the Commission, and the number of cubic yards in the two abutments of each design was plotted against H (R + 2W), where H is the distance from the finished roadway to the bottom of the footings, R is the clear roadway of the slab bridge, and W is the length of one wing measured on the stream side. R was taken as the clear roadway of the bridge, as this figure is always secured at the preliminary inspection of the bridge site. W, the length of the wing, can always be assumed in the field or computed in the office, knowing first the general conditions of the bridge site.

It will be noticed that the number of cubic yards in the two abutments varies aproximately as the height of the abutments; also, that the maximum deviation from the curve does not exceed 2 cu. yds., and more often it is less than 1 cu. yd. In fact, for heights of abutments up to about 16 ft., or where H (R + 2W) does not exceed 900, the quantities so plotted follow practically a straight line, and might be represented by the straight line formula, cubic yards = 0.09 [H (R + 2W)] — 1.37, which often is convenient when the curve sheet is not at hand.

For a particular bridge, suppose the distance from the crown of finished roadway to bed of stream is 10 ft., and the footing should be carried 4 ft. below bed of stream. Then H = 14 ft. Now assume the wings are each to be 13½ ft. long, and that the finished bridge will have a 16 ft. clear roadway. We have now H (R + 2W) = 600, the value to be read at the bottom of Fig. 3.

It will be seen, by locating the point on the curve and going across to the left-hand side that there are about 53 cu. yds. in the two abutments. Where the quantity at the bottom of the figure exceeds 900, we readily see that the curve begins to rise above the straight line. This is expected, as abutments exceeding 16 ft. in height have the base of the wings spread to allow for the proper percentage of steel. This extra width of base is added to the back of the wing wall by a batter, the batter extending up from the footing 4 to 8 ft., according to the height of the wall. This batter does not extend to the top of the wall, as the drop at the end of the wing would increase its thickness at the end, and this does not give the best appearance to the finished bridge. The abutment walls remain 12 in. thick up to 21 ft. high; and from there on, the thickness increases as the height. The slight variation from the curve in solving specific cases may be attributed to the difference in the angle of the wing with respect to the abutment, and the difference in width of footing for bearing. The more nearly the direction of the wing approaches a parallel with the center line of the road, the higher will be the wing at the end, thereby increasing the number of cubic yards; but as the corner formed by the intersection of the abutment wall and wing is measured twice, these two quantities tend to compensate each other.

For the reinforced abutments on girder superstructures, 25 designs were taken from the files of the Commission, and the number of cubic yards in the two abutments plotted against H (R + 2W), the notation being the same as before.

It is to be noted here that the number of cubic yards is somewhat greater than the number of yards in the abutments for slab bridges. This is due to the extra thickness of the abutment walls proper, to give the desired bearing, and the extra width of footings under the wings. It will be noted on this curve, that some of the specific cases used had a wide variation from the mean. This can be attributed to the fact that some of the abutments had extremely long wings that were level on top, and also the different lengths of spans require a little different width of footing under abutments to take the required bearing. A curve of this kind could not take into account all of these conditions; and, while several points fall several yards off the curve, the mean is close enough for the purpose that it is to meet.

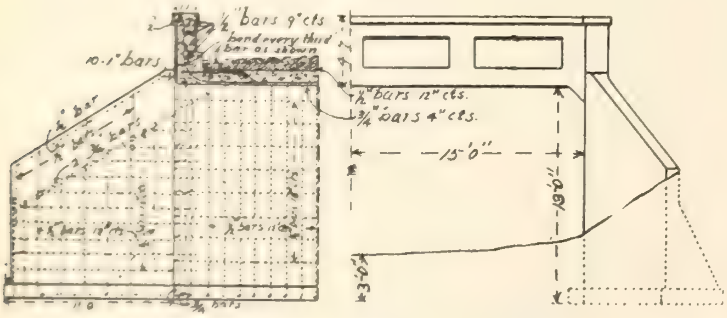

Fig. 2.—Standard bridge of 30 ft. span.

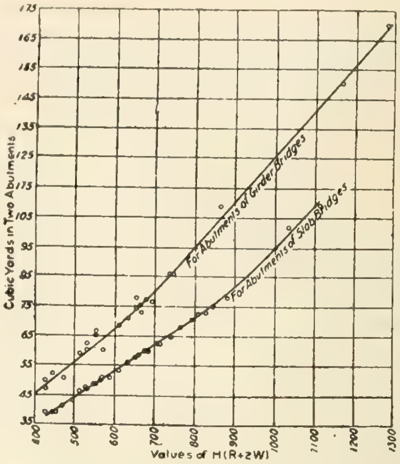

Fig. 3.—Yardage in a pair of concrete abutments.

For a particular case, take the same dimensions that were considered before: Clear roadway, 16 ft.; height, 14 ft.; and length of wings, 13½ ft. We now have 600 to read off at the bottom of Fig. 3. Getting the intersection with the curve for girder spans, we find that the two abutments contain 67 cu. yds. instead of 53 cu. yds. in case of the slab span, a difference of 14 cu. yds. in favor of the slab bridge. Fig. 3, then, is a ready means for comparing the substructures of the two types of concrete bridges and determining the approximate number of cubic yards in each.

Superstructure Diagram—The next thing of importance is to determine the number of cubic yards in the superstructures of the two types of bridges. For this, Fig. 4 has been prepared, and is applicable for the flat-top type of bridge up to 50 ft. in span. For slab superstructures, 48 designs of different roadways and spans were taken from the files of the Commission; and the total number of cubic yards in the superstructure was plotted against the clear span length, the curves drawn through the points having 16, 18, and 20 ft. roadway. The three curves will meet the requirements of the majority of highway bridges. Occasionally a special case arises, such as a skew or extra wide roadway; and then it is necessary to make special computations to determine the number of cubic yards.

For a specific case, assume a bridge to have a 30-ft. clear span and 16-ft. roadway. We readily see the number of cubic yards to be about 43.2.

We may wish to consider for the same site the 30-ft. girder type with 16-ft. roadway. Here we see that the number of cubic yards is about 38.6, or a difference of 4.6 cu. yds. in favor of the girder superstructure. But you will notice for the same height substructure the difference in all cases is in favor of slab bridges. If it should happen that for a single span the girder bridge and the slab bridge should have the same yardage, an advantage still rests with the slab type, as it has been found that contractors usually bid more favorably on this type. There is also another very important point in favor of the slab type. If for any reason there should be any defective material placed in the rail, or poor alignment in its construction, it can be torn down and replaced without disturbing the floor, even after the falsework has been taken down.

Cost Diagram—Having found the expression that is the measure of the number of cubic yards in the abutments and superstructures of concrete slab and girder bridges, the next step is to combine the quantities with a unit-price, that we may determine the approximate cost of each type. For this purpose Fig. 5 has been prepared.

It has been found from the cost data of a large number of slab and girder type concrete bridges built under the supervision of the Illinois Highway Commission, that it is possible to get a very close figure on each individual item that goes to make up the cost of the bridge—(1) the cost at the bridge site of sufficient cement to make 1 cu. yd. of 1:2½:4 concrete; (2) the cost of the necessary lumber for forming 1 cu. yd.; (3) the cost of reinforcing steel per cubic yard of concrete; (4) the labor cost in mixing and placing 1 cu. yd. of concrete; (5) the cost of sufficient aggregate to make 1 cu. yd. of concrete; (6) the cost per cubic yard of concrete for making the necessary excavation to start the concrete of the footings. The two items that largely control the cost of a structure of this kind are the excavation and the necessary aggregate for the concrete. We find that the cost per cubic yard of concrete for cement, forms, reinforcing steel, and the mixing and placing, have narrow limits in their variation.

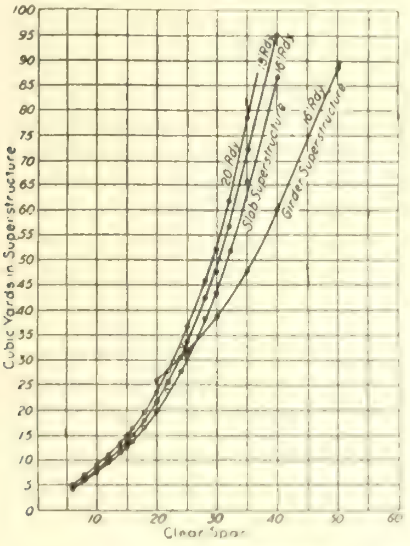

Fig. 4.—Yardage in superstructures.

It therefore appears possible that some definite quantities may be fixed to the first four items, and a curve plotted for the last two, combining them in such a way that the total cost may be readily determined after we have learned the number of cubic yards in the bridge.

The cost at the bridge site of sufficient cement to make 1 cu. yd. of concrete for a 1:2½:4 mixture may vary from $1.75 to $2.10. While the price of cement, the distance it has to be hauled, and the amount required for some aggregates, vary slightly, the extreme variation would not be over 20 cents per cubic yard from the average. From a general average of all cost data on this item, it would seem that we are probably safe in choosing for cement about $1.90 per cubic yard of concrete.

The cost of forms includes all the necessary falsework, bracing, and form lumber for completing the bridge. While this item varies somewhat for different localities, and will vary again where the contractor can use some of his old lumber, it will fall between the limits of 75 cents and $2.50. Experience has shown that about $1.50 for the ordinary type of bridge is usually sufficient, and might well be chosen for this cost curve.

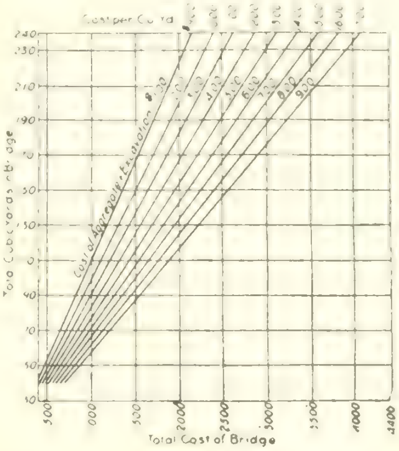

Fig. 5.—Cost of bridge complete.

The reinforcing steel varies from 50 lbs. per cubic yard for substructures to 170 lbs. per cubic yard for superstructures—or an average of about 110 lbs. for the two combined. This steel, delivered at the bridge site under ordinary conditions, and bent ready for placing in the structure, will cost about $2.10.

The item for mixing and placing concrete might vary from $1.50 per cubic yard for crushed rock concrete mixed by hand, to possibly as low as 40 cents for gravel concrete mixed by machinery. This item should also provide for the necessary work in spading the concrete next to the form and securing the desired finish. In spite of the possible wide variation, we find the cost of this item varies but little from the fixed amount of $1.25.

While all these quantities above may seem somewhat in doubt as to their reliability, yet experience has determined that they are not far from the correct figures for normal conditions on the average bridge.

The item of excavation, which includes also cribbing, sheet piling, pumping, and all necessary work to start the concreting of the footings, has been found from the cost data on file to vary from 50 cents to $5 per cubic yard of total concrete in the bridge. The 50 cents per cubic yard is found only in some very favorable cases and on the smaller spans, where there is practically no cribbing, sheeting, or pumping necessary. On the other hand, the cost of $5 per cubic yard of concrete is caused by a soft, seepy soil where cribbing, sheet piling, and excessive pumping are necessary. Quite often the wide variation in the item for excavation is due to poor management on the part of the foreman in charge. This item, therefore, may vary considerably; but with experience with the excavation that is to be handled and with the type of bridge that is to be built, one is able to estimate this item sufficiently close for all practical purposes.

It will be seen that the cost of the aggregate delivered to the bridge site is the second item determining the price per cubic yard of concrete. Under the most favorable conditions with respect to location of a satisfactory aggregate supply, it would likely cost at least 50 cents per cubic yard to haul it to the mixing plant. On the other hand, the cost of aggregate at the bridge site might exceed $4 per cubic yard, as the structure may be isolated from a railroad station, and it may be necessary to ship in either gravel or crushed rock and sand, besides hauling it several miles into the country.

In the light of the wide range on these two items, Fig. 5 has been prepared to give the total cost of the bridge complete, including profit to the contractor under conditions where the cost of excavation, plus the cost of aggregate at the bridge site, might vary from $1 to $9.

For a specific case, we shall assume that a concrete bridge has 120 cu. yds. of concrete. We shall next investigate the condition of the foundation, and assume the cost for completing this part of the work, and express it as so much per cubic yard of concrete. We then approximate the cost of delivering at the bridge site the necessary aggregate to make 1 cu. yd. of concrete. For convenience let us say that these two quantities amount to $3 per cubic yard of concrete. Entering Fig. 5 with 120 cu. yds. at the left-hand side, and following this across to the $3 curve, or the $11 per cubic yard, which is the same thing, and then to the bottom of the figure, we find the cost of the bridge complete to be $1,300. The total cost per cubic yard of concrete is shown at the top for aid in determining the unit-price.

From the figures heretofore given, we are able to determine approximately the number of cubic yards in either the slab or the through girder type of bridge, besides having a ready means of determining the probable cost. While the curves here developed apply only to the slab and through girder types of bridges, similar curves might readily be developed for the deck girder, the through girder floor-beam type, or the arch, and would prove of equal service to the highway engineer.

The foregoing is not intended to supply a substitute for engineering ability, but rather to furnish an aid that will safely direct the engineer who will interpret with judgment and experience.

The Settlement of Solids in Water and its Bearing on Concrete Work*

It is my intention to deal with some of the physical characteristics of stones and shingle, sand and mud, which lead to their separation into these distinct classes by Nature. Practically all the sorting is done by the agency of flowing water, and the chief factor governing the position of any deposit is the ability, or otherwise, of the water to hold the material in suspension. Very finely divided matter remains long suspended, and therefore, if in a current, passes over the place where coarser matter is being deposited, and settles in less disturbed water.

We cannot go into all the details of the process, but the more important factors governing the grading will be considered. Seeing, therefore, that the ability of water to hold in suspension is important we will deal with that aspect of the problem first.

I may premise my further remarks by the statement that, with the exception to be referred to later, a heavy solid can only be supported in suspension in water by an upward thrust equal in intensity to that which would result from a current of water of the same velocity as the body would settle at in still water. This means: (a) It is to the resultant upward thrust due to eddies and disturbances that suspension in water is due; and (b) a measure of the rate of fall of a body through water will be useful as measuring its resistance to suspension.

A solid body which is of higher specific gravity than water will sink in the latter at a definite rate. Starting from rest, it will have two distinct stages in its fall:—

(1) An accelerating stage, during which the force operating on the body to pull it down is greater than the retarding force, due to friction and the impact of the water particles on the under surface of the body.

(2) A stage of uniform motion which is attained where there is an equilibrium between the downward and upward acting forces.

In practical work the first or accelerating stage is so very short as to be negligible, except for very large bodies; in the case of sand, and even pebbles up to ½ in. diameter, it is only by the most delicate measurement that the existence of an accelerating stage can be detected.

The chief factors governing the rate at which a body will settle through water are: (1) Its size, (2) shape, (3) specific gravity, (4) the temperature of the water, or any cause affecting the viscosity of the liquid, (5) the quantity of suspended matter present in the water.

Size

If v represents velocity of fall in foot seconds, d diameter of body in feet, s specific gravity of body, and k a constant depending on the shape of the body (equal to about 9.35 for spheres, 6.12 for irregular grains of sand, according to my latest experiments), the velocity of fall in water for bodies over 1-16 in. in diameter will be given with fair accuracy by the expression:—

$$v = k \sqrt{d\,(s - 1)}.$$

It will thus be seen that the rate of fall varies directly as the square root of the diameter.

Shape of Body

I found that a curious law governs the position a body of irregular shape takes up in falling through water. We are accustomed to apply the law of "least resistance" to explain many phenomena in Nature. If we apply it in the present case, it would seem to indicate that a body such as a disc will settle through water edgewise, a rod endwise, and so on; but the contrary is the case; a disc always settles on the flat, a rod with its greatest length horizontal. I have established this fact beyond question, and it would appear that a body chooses that position which offers the greatest resistance to its fall. For this reason a sphere settles more rapidly than any other shape, and flat, thin bodies, such as slates, settle very slowly indeed.

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* From a recent paper before the Concrete Institute, London.

Specific Gravity

Referring to the formula given above, it will be seen that the velocity of settlement varies directly as the square root of the specific gravity of the body minus that of the liquid in which it settles.

Water Temperature

This has a profound effect on the rate of fall of fine matter in water, due, no doubt, to its influence on viscosity. A rise in temperature of the water produces an increased rapidity of settlement, which is most marked with the more finely divided materials. The rate of settlement of silicious sand of 8-1000 in. diameter is doubled if the temperature be raised 80 deg. Fahr.

Amount of Suspended Matter Present

It can be shown experimentally that the greater the load of suspended matter, the slower its rate of settlement. Finely divided solid matter held in suspension in water has practically the same effect on the specific gravity of the mixture, measured by a floating hydrometer, as if it were in solution.

It is reasonable under the circumstances to suspect that the amount of heavy matter suspended in a liquid will influence its rate of settlement in the same way as an alteration in the specific gravity of the liquid itself; and this is found to be the case.

Practical Application of Results

We now come to the practical application of the results above referred to. We may first consider how we are to define the meaning of the words "stone" or "shingle," "sand" and "mud." It is obvious that any definition to be of use must be based directly or indirectly upon size of grain.

There appear to be two distinct sizes of particle to which further attention must be given. It will be observed that the application of the formula given above is stated to be limited to sizes over 1-16 in. diameter. The reason for this is as follows: In experimenting on the rate of settlement of different grades of material I found that the value of k in the formula referred to was fairly constant over 1-10 in. diameter; but for grains of smaller size it fell off rapidly in value, thus showing that some factor was operating in the smaller grades which was not taken into account in the expression given. That this factor was the viscosity of the liquid I have no doubt, and its preponderating effect in the smaller grades may be due to the rapid increase in the ratio of surface to volume or weight, as the size is reduced, or to the passing of a critical point in the velocity such as that shown by Osborn Reynolds to divide stream-line flow from eddying-flow.

While it is not strictly correct to speak of a critical diameter at which this effect commences to appear, I found on plotting values of the constant k referred to that at about 1-10 in. diameter the curve bent rapidly downward, whereas above this it was practically horizontal.

It would seem that we have here a natural dividing line between sand and shingle. Any grade of material having grains over 1-10 in. diameter would, on this basis, rank as shingle, while grades finer than this would rank as sand.

It must however, be understood that there is really a shading off of shingle into sand, and a range of sizes of from, say, 1-20 in. to 1-10 in. diameter, which might be ranked either as coarse sand or fine shingle with equal accuracy; but it would simplify matters to fix the line more or less arbitrarily at 1-10 in. diameter, and neglect the gradations referred to.

Again, mud particles sometimes approach in size the limits of microscopic vision; so that we have clearly a considerable range of size to choose from in defining mud as distinct from sand. If we decided to take all below the critical diameter referred to as being mud, we have to consider how it is that particles of such a size as to be permanently suspended in water ever reach the bottom to form mud. This is not such a serious difficulty as might appear, for it is well known that certain physico-chemical actions often tend to hurry the precipitation by producing flocculation of very fine matter, whereby collections or groups of particles are formed which operate as single bodies, and thus settle much more rapidly than would otherwise be the case. This is one of the causes of the formation of bars and deltas, as the sea water tends to thus precipitate mud coming down rivers.

Ordinary deposits classified as clays or muds contain varying proportions of silica and alumina in a more or less comminuted state, and their properties vary with the proportions present. The greater the percentage of alumina present the more plastic and "mud-like" in the ordinary sense does a sample become; so that the distinction between sand and mud is partly chemical, partly physical. From our point of view, however, it does not appear desirable to base a distinction between mud and sand on composition; and it is upon the size of a grain that we, in practice, rely to distinguish them.

To define mud or dust by the diameter of its grain is not, however, of much practical use to the engineer, who cannot examine doubtful samples with a microscope and micrometer. A method of definition is therefore required which will be practically applicable, and I would suggest that we consider as mud or dust any particles which, when stirred up in water in a glass vessel 12 in. high, cause a discoloration by suspension, which does not clear immediately—that is, within, say, a minute. This will cover all grades from about 1-1000 in. diameter down, and include clay proper, which, when present in the aggregate as a coating on the stones, is very prejudicial to the strength of the concrete, owing to the interference with proper adhesion between the cement and the aggregate.

Concrete Work Under Water

When concrete is allowed to settle through water, the effect is to bring about an analysis into coarse and fine strata. The larger particles—stones, gravel, etc. —settle more rapidly than the finer sand and cement; with the result that they reach the bottom first and form a layer over which the sand and cement settle, also in separate strata—the cement on top, the sand underneath it. The separation is not quite complete, because the larger particles always carry down in their wake some of the smaller, and for other reasons which we need not go into. Even when allowed to fall through only a foot or so of water the fine cement is washed out and, to a great extent, remains suspended, owing to the disturbance of the water. This is such a well known fact that it does not call for further attention here.

Excess of Water in Concrete

When fine and coarse particles are suspended in a liquid the coarse, by virtue of their greater weight compared with their surface, tend to settle towards the bottom, displacing the fine matter upwards; for it must be remembered that a body falling through a liquid always generates an upward current to fill the space which it occupied, and this is sufficient to keep very fine particles suspended. The case of immediate interest is that of concrete mixed with too much water; in such, when kept in a state of disturbance by ramming, there is a tendency for the coarse part of the aggregate to work towards the bottom, the finer sand and cement towards the top giving a deceptive appearance to the concrete of having been thoroughly consolidated.

Concrete Mixing

It is not uncommon to meet with a so-called concrete mixer which, when closely watched, is found in some cases to separate the fine from the coarse parts of the aggregate. I have already indicated that permanent suspension of solids in water results from a continuous disturbance of the water, also that while a very slight disturbance is sufficient to suspend fine matter, this is not the case with the coarser grains. It is, therefore, easy to see that with sufficiently liquid concrete a badly designed mixer may produce sufficient agitation to suspend the sand and cement, but not the coarser part of the aggregate, which consequently gradually separates out as a bottom layer. This is, of course, an exaggerated case, and implies an excess of water; but while a mixer may not be so bad as to operate as a separator, it may be delayed greatly in its mixing operation by the above cause. Of the two chief types of mixer now in use, one depends on revolving arms operating in a fixed vessel, and this is the type most likely to be affected by the cause described, unless very carefully designed with proper provision for a positive mingling of the different parts of the concrete as distinct from mere agitation. The other type, in which mixing is effected in a revolving vessel fitted with shelves, is more likely to produce good concrete, as its action depends on repeated shifting of parts of the mass from one place to another—for example, from bottom to top and sides to middle.

Test of Concrete Mixing

I hold very strongly the view that sufficient attention has not been given to the proper mixing of concrete. It is a process which has a perfectly definite point of completion, which is, however, not always attained to. Concrete may be said to be thoroughly mixed when all the ingredients are as uniformly distributed as possible throughout the mass. If we accept this as a definition of proper mixing, then samples taken from different parts of a heap of concrete should contain the same proportion of stone, sand and cement. The different rates of settlement of these three afford the engineer a simple method of measuring the relative proportions in any part of a heap of concrete. If, for instance, a small quantity of concrete be placed in a tall glass vessel full of water, shaken up, and allowed to settle, three distinct layers of sediment are formed. The stones or gravel settle immediately, then follows the sand, and after a much longer period—about ten minutes in a vessel 12 in. high—the cement forms another well-defined layer. The depth of these layers varies as the amount of the respective materials present; hence, a simple measurement of the depths in two samples enables us to compare the relative quantities of the different ingredients at any two parts of the heap.

In practice the application of this test may be simplified thus: Excluding the case of concrete, which is semi-liquid, and in which the coarse matter may therefore have separated from the fine, we may safely assume that if the sand and cement be properly mixed the coarser parts will also be mixed, since the time required to mix uniformly increases as the grain becomes finer. I have therefore found it advisable to take account only of the distribution of the cement through the sand, as this permits the test to be made with much smaller samples of concrete than if the coarse aggregate were also included.

Inspection as Test of Mixing

There were two special tests made, to which attention should be drawn. The first was directed towards determining what was the true value of inspection alone as a test of concrete mixing. For this purpose a sample of mortar of the proportions cement 1, sand 2, was made; beside this was placed another having cement 1, sand 2½, but no difference could be detected by eye. The result was the same with cement 1, sand 3, and it was only with cement 1, sand 3½, that any difference in appearance could with certainty be detected. On applying the sedimentation test to these samples, the difference in strength between 1 in 2 and 1 in 2½ was easily observed. It is therefore quite clear that inspection alone—the test which is ordinarily applied—is not sufficient to determine whether concrete is properly mixed or not.

Hand Mixing

The second test I should like to draw attention to is one of hand-mixed concrete, turned twice dry, twice wet, on a London works of a reputable contractor.

Seven tests were made of different batches, and uniformity found in one only. The following figures shows the percentage variation in the amount of cement in different parts of each batch:—

	Per cent.
Batch No. 1	4
„ No. 2	7
„ No. 3	15
„ No. 4	0
„ No. 5	24
„ No. 6	15
„ No. 7	17

All batches, except No. 5, were mixed in my presence, or that of the foreman or engineer; No. 5 was mixed by the men alone, without supervision. It would therefore seem that when concrete is mixed by hand it may not be of uniform strength, and that to bring the weakest parts up to the strength required an excess of concrete must be used equal to at least 10 per cent. more than if uniformity of mixing could be assured.

I am aware, however, that mixing machines vary greatly in their ability to mix, and also require supervision in their working as well as hand mixing. I have found the test described very useful in determining for any particular mixer the time or number of revolutions required to give a uniform concrete. It enables the engineer to say when mixing is complete with any particular aggregate or proportions, and thus to avoid either improperly mixed concrete or the unnecessary curtailment of the output of a machine due to over-mixing.

Two new factories will shortly be erected at Thorold, Ont. The Pilkington Glass Company, the largest manufacturers of glass in the world, and the Beaver Board Company, will start erecting there shortly.

Value of System in Technical Offices

Main Considerations for the Engineer in Planning this Important Office Routine: —Classification, Filing, Indexing and Cataloging

By A. L. Heywood

MANY large engineering offices have librarians to arrange and catalog the varied data which the broad scope of their activities requires. Small offices and solitary engineers have the same needs and similar problems, but two conditions prevent solving them: In the early stages of business, when time is plenty, there are little data to file; later when work, drawings and notes have accumulated, there is no time for systematic filing. So as the years pass swiftly various crude and unfinished methods of indexing and filing are used from time to time, until some sudden call for an old drawing, notebook, or specification find the engineer unprepared, the office in a turmoil, assistants perplexed, and everyone surprised that so small a matter involves such serious trouble. Amidst this confusion and furor the engineer probably decides that he needs more system, so he orders his stenographer to prepare more indexes, the draftsmen and field workers to start a different record or drawings and notebooks and the office boy to revise his list of blueprints. If the matter of filing comes up, he settles it offhand with instructions to "put the tracings in that drawer, the catalogs on this shelf and the books in the closet." Then he is gone, before anyone can suggest that the drawer is not large enough, the catalogs do not fit the shelf and the closet is already occupied.

The purpose of this article is to indicate the matters which the engineer should consider when planning his office system, the order in which they should be considered, and the relations between them. If it were a problem identified with his professional specialty the engineer would analyze the situation, classify his facts and proceed in logical order, but because office routine is carried on by the cheaper help he gives little heed to the subject and decides without deliberation questions which may affect his daily work for years to come,

System in any office, so far as it relates to the preservation and use of data and records, comprises three subjects, which may be designated as

I. Classification.
II. Filing.
III. Indexing and cataloging.

Classification

I. Classification may be regarded as consisting of two distinct matters: (1) The material to be filed. (2) The places in which to file it.

1. The material to be filed presents two aspects: (a) The physical form in which the data exist. (b) The subject matter or contents of books, drawings, etc.

This analysis is obvious, but many persons lay out a system by subject, file their records according to size and shape, index by job numbers, and apparently never realize that the various classifications rest on a different basis. Then they wonder why so many demands on the records remain unanswered. Unless the designer of an office system recognizes clearly the differences indicated between the abstract and the concrete he is likely to fail in grasping his difficulties.

I. 1. (a) The form in which technical matter comes to the office librarian can be listed as follows: Field books or original notes made outside the office; computations; drawings made in the office; blueprints, maps and drawings from outsiders; catalogs; samples of materials of construction or supplies; books, periodicals, reports of societies and governments; photographs and negatives made by the office force; photopraphs from outsiders; miscellaneous notes, data, instructions; and reports from subordinates and copies of reports to clients.

With the last item we reach the business side of the office as distinguished from the technical, and the classification meets correspondence, accounts, cost records and similar papers, which may have been satisfactorily arranged from an early date, as the methods of handling them have been more widely discussed. However, if the business system is not right, the organizer has so much more to add to his problems.

Matter to be Filed

I. 1. (b) The subject matter recorded in the preceding forms varies with each office and engineer, and it is for him rather than a subordinate to decide what the classification should be. If he has numerous clients and a variety of work, the old system of job numbers may be the most practicable. If he is doing continuous work for a few corporations, the data can probably be arranged more conveniently by subjects rather than by personalities. The purpose of this article, however, is not to decide what classification should be used, but to point out the phases of classification. Of these, that of first importance in a technical office is its use of records as a library of reference in addition to their function as part of a commercial business. The difference may seem slight to "practical" men, but a recognition of its existence may clear up some perplexities. A classification which provides amply for finding the work done in 1907 or for the town of Jonesville can completely fail to locate the computations for bridges of 50 ft. span or the bearings available for 6 in. shafts. Common business methods are usually sufficient for office routine, but additional schemes are needed to make available to expensive assistants all previous records which can save brain-wearing work and leave more time for original design on new problems.

Having classified according to subject, the engineer should hesitate before bringing in other phases of his work, and should recognize that he is introducing additional complications and a different basis of division if he attempts to classify according to the value of the record or other arbitrary standard. Field notes and drawings seldom become as "dead" as a closed account in a ledger, and few offices can afford to maintain separate files completely classified of "proposed," "preliminary," "final," "approved" and "void" tracings, notebooks and blueprints. Subject matter alone presents sufficient difficulty, and if the other phases are introduced it should be clearly understood that the dividing lines are entirely different and often incompatible. The information contained in a report on a town's water system is the same subject, whether the report is preliminary or final; or if it is not, the distinctions "preliminary" and "final" do not aid in its classification. If a complicated system is desired, the designer should understand that he is trying to attain several ends, and should not think that a division for "reinforced concrete" is on the same basis as one for "preliminary computations." It should also be remembered that all the phases of classification can be shown more easily and more cheaply on the cards of the index than in the filing systems.

I. 2. After classifying his material, the next step before the engineer is to classify his space and office appliances—and this should be done even if he has but one shelf, two drawers and a desk. It is not the present purpose to discuss various modes of filing but to indicate some of the elements of the problem. Disregarding the question of cost—of considerable importance to beginners—there remain many difficult questions which relate not only to filing and indexing but to the methods used in the drafting room and the field. The sizes of notebooks and drawings, the amount of space that can be spared for catalogs which are not the latest, the relative value of flat, folded or rolled filing of maps and blueprints, and the usefulness of old computations compared to the room they take are only illustrations of the topics confronting the engineer who attempts to fit his classification of intangible subjects to the very definite limits of filing sections and drawers. Even if he settles the sizes of paper and field books which shall be used by his employees he finds before him a large and increasing collection of blueprints and catalogs from sources beyond his control. Like other difficulties in his profession, the only way to solve these problems is to recognize them, analyze them, and when no satisfactory solution seems attainable make the best compromise possible between the ideal classification and the prosaic limits set by the dimensions of the matter before him to file, the space at his disposal and the limits of the pocketbook. But above all, let him reflect on these things himself, become familiar with his own plant, and not expect subordinates to decide questions for which he himself can find no satisfying answer.

Filing

II. After classifying his records and the storage capacity of his office, the engineer should take up the matter of filing. Classification is not filing or indexing, but an indispensable preliminary to both, if they are to be rational. However, classification well done may eliminate a part of the filing in the small office. Two or three field books may contain notes for a dozen jobs; neither filing nor indexing them is important when a business is young, but their place in the classification and a method for their ultimate treatment should be determined. When all drawings and records are grouped before the creator of the system it may be found that other parts also are small in bulk though important in contents. It may happen that the least valuable blueprints and catalogs take the most space, and what seems to be essential to the business requires little attention so far as filing is concerned. This measure of relative values is one of the purposes of classification and should give a better understanding of what has been done and of the facilities available for doing more.

The relation of filing and classification may not appear clear until an effort is made to put away records which have been analyzed and sorted into an elaborate system. Then it will be seen that the more complicated the system, the more difficult is the filing, and that an inventory of the furnishings should be made before the final classification of the data is absolutely settled, and the latter made to conform to some extent to the limitations of the office appliances available. What has been written about conflicting classifications has material illustration under the subject of "Filing." It is difficult to keep a complete set of specifications for roads and walks and file the same material under the titles "Live Work" and "Dead;" or to keep what is "Proposed" and what is "Approved" separate and at the same time put together the drawings pertaining to mill construction. Subject matter is one thing; what is done with reference to that subject is another; but few engineers appear to understand the distinction so far as it relates to office affairs.

Value of Material

The intrinsic value of tracings, notes of surveys and photographic negatives is the feature of filing which specially distinguishes technical offices from those of purely commercial character. Great inconvenience may result from the loss or injury of ledgers and cash books, but they seldom represent so much expensive labor as do the notes of a difficult survey or the drawings of a complicated mechanism. Filing should take into account not only the exemplification of a logical classification but also the continued efficiency of the material handled. A system is not a success if the daily filing and finding involves unusual and unnecessary wear on drawings, records and nerves.

The fundamental requirement of systematic filing is this principle: Anything that is worth preserving is worth filing. The most common source of confusion in all offices is the keeping apart from its regular place of some record or drawing which did not seem equal in value to the other matter filed. This lack of decision by those who say: "I thought it might be handy some time, but it wasn't worth filing," causes many a weary hunt when the doubtful data are finally sought. Either put it in its proper place or throw it away, making proper record of its destruction and the reason.

Indexing and Cataloging

III. After the classification and filing has been carefully considered and executed, indexing may be taken up if necessary. The average man has a greatly exaggerated idea of the power of the card catalog and expects it to cover all the sins of the office system and of his own vagueness of thought. When put in words, it seems absurd that anyone should expect to find by the use of typewritten cards a thing which he cannot name or a subject for which he has no intelligent description, but exactly that demand is made daily in offices, libraries and drafting rooms. A good index may assist hazy thoughts; it may give definite direction to uncertain queries; but it cannot remedy a user's ignorance of language or correct errors and omissions by those who made the material to which it is supposed to form a key.

Another error is to consider the index an independent appliance, able to fulfill its function without regard to anything else in the office. A little reflection will show that the index is almost useless if the filing is not done with care by some definite system which has been fixed for permanent use. The meaning of "index" is to point out, but the pointing out is not easily changed. If the nature of the office furniture, the numbering of books and drawings, and the position of data are not settled, the references on the cards may become useless at any minute. The "index" no longer indicates. Many an engineer walks into his office with a roll of blueprints or bundle of catalogs, hands them to his stenographer with instructions to "index them," though no one has any idea where they are to be put or what relation they bear to the other material on file. All that the index can show in such an office is that some time there were on hand somewhere certain blueprints or data. Such knowledge in time of stress is worse than none at all. Few records well arranged are more useful than large accumulations without system. Good filing of well-classified material needs little indexing. The ideal filing is that which requires no indexing.

Repairing Cement Concrete Pavements

Repairing With Cement Mortar and With Tar — Most of the Wear at Joints, Especially When Not Protected by Steel Plates

By F. F. Rogers, Deputy Commissioner State Highway Department, Lansing, Mich.

THE oldest concrete pavement of which the writer has knowledge, was built at Bellefontaine, Ohio, in 1893 and 1894. This pavement contains 4,400 square yards and was built of a local cement, a leaner mix being used in the base than in the top. On December 14th, 1912, Mr. C. A. Inskeep, city engineer, wrote me that the approximate total cost for repairs had been $200.

When laid, the pavement was cut into squares, similar to those commonly seen in cement concrete sidewalks, and the principal part of the wear has been along the longitudinal joints thus formed. The wheels of vehicles form grooves at these places which they have a tendency to follow.

Repairs have usually been made with cement mortar or concrete, which has been placed in the grooves after they have been chiseled out. Sometimes this patch has been dovetailed in, that is the sides of the notch incline towards the axis of the groove rather than outwards.

In some places paving bricks, laid cross-wise, have been cemented into the prepared notch instead of making the entire patch of concrete. This has been done when it was impracticable to keep traffic off the street long enough for a concrete patch to harden.

The writer has not seen this pavement, but if the reported figures are accurate, the total repair cost has been only 4.77c per square yard in 18 years, or 0.265c per square yard per year—a repair cost which seems almost incredible.

Experience of Town of 2,500

Bad Axe, Michigan, a town of 2,500 population, paved its main street for a distance of one-half mile with cement concrete in 1908. Gravel taken from beneath the subgrade of the pavement was used for the aggregate. It was laid as two course work, the base being a 1:6 mix, 5 inches thick, with a wearing surface of a 1:2 mix, 2 inches thick. The contractor guaranteed this street for five years, hence the city has made no repairs up to this time. Transverse joints were placed every 12 feet. There are no longitudinal joints, except at the gutter lines, though the pavement is from 30 to 50 feet in width.

The contractor has patched a few places, by chiseling out the old pavement to the subgrade and filling the excavation with two course concrete of the same mix used in the original construction.

The transverse joints now show considerable wear, the groove, due to chipping off the edges of the adjoining slabs, being, in many places, two inches deep, and very perceptible when riding over the pavement in an iron tired vehicle even at a slow speed. Similar wear is visible around the edges of some of the patches. There are also some holes which need repairing.

The pavements at Grant Lodge and Scottville were laid in 1910. Some limestone was used for the coarse aggregate in these pavements. Both were two course work and were in need of some repairs the second year, but mostly at the joints. In neither town have the repairs received the attention that should have been given them.

The first concrete pavements in Ann Arbor were laid in 1909, but in Alpena, Lansing, Coldwater and Charlotte they were laid one and two years later and have needed but slight repairs.

The pavements at Ann Arbor and Lansing were top dressed with tar and sand, refined tar being used on all the later work. This top dressing wears off annually, particularly in the central portion of the roadway, and has to be wholly or partially renewed at a cost of from 5c to 6c per square yard. None of the other pavements that have been mentioned were thus treated, so far as the writer has any knowledge.

Details by a City Engineer

As already noted, Kalamazoo, Marquette and Red Jacket each have considerable cement concrete pavement, built under the R. S. Blome patents, but Kalamazoo is the only city from which I was able to get any details concerning the repairs.

Mr. S. Lenderink, City Engineer, writes:

"The surface is carefully watched and all holes repaired when they are small. The holes have been thoroughly cleaned, washed with cement and filled with a 3 to 1 mixture of good bank gravel and Portland cement. These repairs have given good results.

"The pavement now shows a large number of long surface cracks with the edges wearing rapidly. The percentage of surface thus far repaired is small, but a larger percentage will have to be repaired in the next five years. This pavement was laid five years ago last summer at a cost of $1.74 per square yard. It has a 5 inch base and 2 inch top."

As already noted, some concrete has been laid on the rural highways in the counties of Berrien, Huron, Saginaw and Wayne, but in the two former counties the roads were built in 1912 and have needed no repairs. On these roads, sand and gravel was used for the aggregate in a 1:2:4 mix.

Saginaw county built its concrete road in 1910. Sand and crushed limestone was used for the aggregate. Each of the two layers is 3 inches thick. The bottom is a 1:2:5 mix and the top a 1:2:4: mix. The pavement has had quite extensive repairs. The portions that have been found defective were [illegible] mix or to a less depth than was specified. Repairs have been made by cutting out the defective [illegible] the corrected subgrade and filling with concrete as above specified for the top layer. No extra refinements were used in these repairs, and, so far, no trouble has been had with the places repaired. This pavement was only 9 feet wide in the central portion of a 24-foot roadway. It carries a rather heavy mixed traffic, consisting of heavily loaded farm and trucking wagons throughout the season, and a heavy sugar beet traffic (loads 2 to 5 tons) during the months of October and November. Repairs have been very small on the better built portions of this road.

Wayne county began building concrete roadways in the summer of 1909, and has built a larger mileage each succeeding year. The first two years 2-layer concrete was built, the bottom 4½ inches being a 1:2½:5 mix and the top 2 inches being a 1:2:3: mix, using crushed cobblestones for the coarse aggregate in the surface layer. Since then, one layer concrete 7 inches thick, with a 1:2:4 and a 1:2:3: mix has been adopted, using washed pebbles and sand for the aggregate. The richer mix was used last summer.

On November 23rd, last, an inspection was made of the Woodward avenue concrete roadway, one mile of which was laid previous to July 1st, 1909, and 1 1-5 miles of which was laid in the early part of the season of 1910. Both of these pieces are the two course work above referred to. These pavements are 18 feet wide and have transverse expansion joints every 25 feet, making 211 sections to the mile. The oldest mile has had nearly four seasons wear and has passed through three winters. On the first mile, 9 sections show one or more pit holes, 17 sections show transverse cracks, a very few of which reach entirely across the roadway, and 61 sections show longitudinal cracks, many of which reach the whole length of the section. In fact, most of these longitudinal cracks are grouped, several contiguous sections showing longitudinal cracks are the exception and not the rule.

The 1 1-5 mile stretch, which has had nearly three seasons wear and has passed through two winters, shows defects as follows: Pit holes, 8 sections; transverse cracks, 7 sections and longitudinal cracks, 13 sections. For better comparison, I will say that 29 per cent. of the sections showed longitudinal cracks on the first mile, while only 5 per cent. of the sections showed longitudinal cracks on the second 1 1-5 miles. Roads of more recent construction show proportionately less defects.

In making repairs, the cracks, whether at expansion joints or other places, are broomed out clean, preferably when the weather is warm and dry, and poured full of hot refined tar. A portable heating kettle is moved along on the pavement and the tar is poured from long nozzled cans, which are fitted with long wooden handles. When filling a joint, the workman backs up, dragging the nozzle of the can along the crack which is filled about as rapidly as a man can work. As fast as the joints are filled, another laborer follows up and spreads a layer of dry sharp sand over the tar to a depth of from ¼ to ½ inch. Pit holes, unless large, are filled with tar and sand in the same manner. It might be added that the tars are found to adhere to concrete better than the asphalts.

Repairs of this kind cost about $50 a mile, and have to be repeated each year. They prevent further deterioration of the pavement, both at the transverse joints and at the cracks which nature has formed. In fact, so far, the cracks do not seem to menace the life of the pavement.

In a few places where holes have formed, due to defective mixing or to some foreign substance accidentally getting into the concrete, repairs have been made by chiseling out the concrete down to the subgrade, brooming off the sides, and filling the excavation with concrete of the same kind as used in the original construction. The cost of this kind of repairs has been a negligible quantity, as compared with the others.

The transverse joints on the early construction were formed by placing three strips of tar paper between the 25 foot sections. Later, sheared steel plates, separate by strips of tar paper and having prongs which are bedded in the concrete of the adjoining sections, have been used.

On two roads which were completed late in the Fall, short sections of the surface became thickly pitted to the depth of ¼ to ½ inch, due to opening the road to traffic before the concrete was thoroughly hard. These defects also have been repaired by covering the entire surface of the pavement with refined tar and coating with sand, as in the case of the joints and cracks. This coating has to be renewed when it wears away.

A few sections of the Michigan avenue road, not in need of repair, were tarred and sanded in 1911 to watch results. Only a small part of this was worn off during the first year. So far, the kind of repairs I have endeavored to describe are all that the Wayne County Road Commissioners have found necessary or advisable.

Concrete Construction in Ancient Rome

THE presence of puzzolana, or volcanic cement, in the immediate neighborhood of Rome could not fail to suggest to so intelligent a people as the ancient Romans the advantages of concrete construction, especially as the removal of ancient buildings continually provided them with material to use in such construction. Gray tufa was the stone most used in the early masonry, and in the latter part of the second century B. C. concrete containing this material with puzzolana as a binder began to make its appearance, especially in the foundations of large buildings, and later in wall construction, though always with brick or stone facing. Some sand or gravel was mixed with the lime and puzzolana used in these early periods, and the aggregate contained stone, brick or broken tile. Besides the early tufa, travertine and peperino came later into use in this construction. Selce, a harder stone, was used also in later times. In the reign of Julius Caesar concrete became quite common, and under Augustus its use was almost universal. The puzzolana of this period was of a reddish color and this gave the concrete its characteristic hue. In the period when tufa was most used in the aggregate the size of the stones was quite large, often exceeding a foot in diameter. When brick and broken tile came into use, the pieces were much smaller, averaging not more than 2 inches. Facing continued to be used on the walls in Caesar's time a small stone 2 x 2½ inches being used, tesserae. Recticular facing was later introduced and continued popular for many years. Cut brick or tiles came about the same time, and about 50 A. D. triangular brick was much used. In the time of Septimius Severus the brick had reduced in thickness to about 1 inch, as compared with 2 inches in earlier work. Concrete was never used as a surfacing material except in insignificant buildings.

Insulating Walls in Frame and Brick Buildings

Two Methods of Accomplishing the Desired Results and the Materials Used for the Purpose

THE extent to which cold storage rooms are being utilized at the present day and the inquiries that are constantly arising as to a scheme for properly insulating the walls of them, renders interesting the following suggestions covering two methods of accomplishing the desired results. The first case to which we shall refer relates to the walls of a frame building and the manner is clearly indicated in Fig. 1 of the accompanying illustrations. It will be noticed from careful inspection of the sketch that on the outside of the 2 x 4 in. studs which are placed 16 in. on centers is nailed 1 in. sheathing boards. Over these are placed two layers of building paper, which in turn is covered with 1 in. Novelty siding, this furnishing the finish for the outside.

On the inside there is first a double layer of 1 in. sheathing boards with two layers of heavy building paper between them. Against these another row of 2 x 4 studs is placed and to them is nailed another double thickness of sheathing boards with building paper between. To this double row of sheathing and opposite the double row of studding are 1 x 2 in. furring strips, to which expanded metal lath is attached. The plaster is then applied, giving the finish for the inside of the room.

It will be seen that this method of insulation gives three air spaces throughout the depth of the wall. In one of the 4 in. spaces the cells between the studding are filled with mineral wool, so that in these the air is dead. The inner air space is only 1 in. deep, but the combination tends to prevent the transmission of heat from the outside to within, or the cold air from within the room to the outside.

In Fig. 2 of the sketches is clearly shown the method of insulating walls of brick, stone or concrete, as the case may be. Here the inside of the wall is treated with two coats of pitch, asphalt or tar. After the pitch is applied 1 x 2 in. furring strips are nailed to the wall, being spaced 16 in. on centers. A horizontal course of [illegible] in. sheathing is then nailed to the furring strips, a double layer of heavy building paper is placed over the sheathing and then another course of sheathing boards is laid diagonally on top of the paper and nailed to the furring strips through the first course of sheathing. The next step is to set up a row of 2 x 4 in. studding, space them 16 in. on centers and nail to the sheathing. The face of the studding is covered with a double course of sheathing boards with building paper between as in the first instance. The space between these studs is filled with mineral wool or some other insulator of heat and cold. Furring strips 1 x 2 in. and placed 16 in. on centers are then nailed to the surface of the last course of sheathing and expanded metal lathing fastened to the strips. A three-coat layer of cement plaster is then applied as a finish or glazed tile may be imbedded in the cement as an inside finish, according to preference.

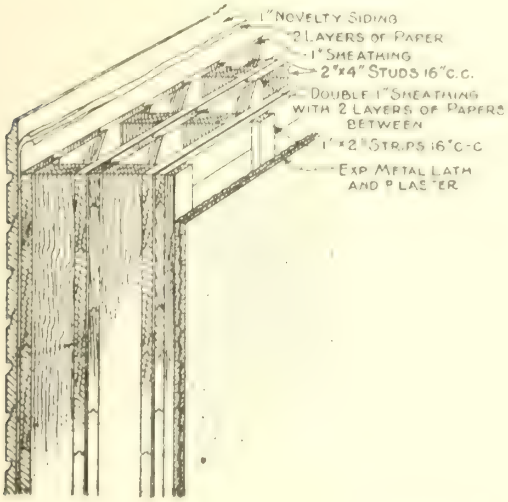


Fig. 1.—Insulating walls of a frame building

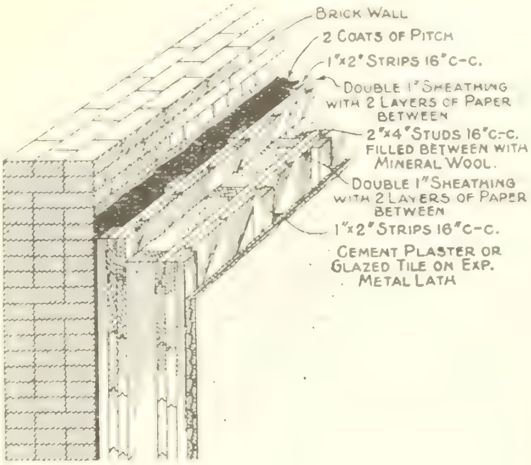

Brick Wall
2 Coats of Pitch
1"x2" Strips 16" c-c.
Double 1" Sheathing with 2 Layers of Paper Between
2"x4" Studs 16" c-c. Filled Between with Mineral Wool.
Double 1" Sheathing with 2 Layers of Paper Between
1"x2" Strips 16" c-c.
Cement Plaster or Glazed Tile on Exp. Metal Lath

Fig. 2.—Insulating walls of a brick structure

If the masonry wall is thick or is otherwise well insulated the inner layer of sheathing may be omitted and the expanded metal lath attached directly to the face of the 2 x 4 in. studding.

Experience has shown these two methods of construction to admirably serve their purpose and although somewhat expensive the first coat is more than compensated for by the satisfactory results which are accomplished.—Building Age.

Several recent German inventions relate to automatic devices intended to stop escapes of gas, but it is probably true that up to the present no system has been really satisfactory, and among the newer devices none inspire confidence, though possibly hints may be obtained from them which will lead to the solution of the problem. In some cases reliance has been placed on the expansion of metal by heat, and the motion obtained in this manner has been used for turning a valve or tap. Several forms of apparatus which have worked quite well in the laboratory have proved useless in practice, and generally failure could be traced to the friction of the tap. A tap to be gas-tight must necessarily have a closeness of fit which militates against the reduction of friction below a certain point. Even if frictional resistance were satisfactorily overcome in the apparatus, its initial condition cannot be maintained [illegible] and the tap fails to respond to the slight force applied to it. The solution of the problem may lie in some arrangement whereby a liquid valve or a membrance is introduced into the gas supply with the object of shutting off the gas.

Unusual Activity at St. John, N.B.

Many Important Undertakings to be Placed Under Way Immediately — Large Pulp and Paper Mills Projected

Correspondence of The Contract Record

St. John, N.B., April 5.—There will be an unusual amount of building and heavy construction work in New Brunswick this year. It will not by any means be confined to the city of St. John. There will, therefore, be an active demand for builders' supplies. To begin with public works, the spring freshets have done a more than usually large amount of damage to bridges, and there will be a good deal of repair work of this nature in various parts of the province, while the new bridge which is to connect East and West St. John and that which is to be erected across the Miramichi River at Newcastle will require a large amount of structural steel.

The announcement is made that the New Brunswick Shales Limited will begin extensive development work among the oil shales in Albert County at once, and this, it is stated, will result in the building up of a new town and perhaps two of them in Albert County, as it is the intention of the company to put in an immense reduction plant. All the large towns of the province anticipate a greater building activity than usual.

With regard to supplies, it is thought there might be some difficulty in getting prompt delivery of structural steel. The price of lumber will be high this year, as there is a good general demand from the outside markets and the supply will not be above the average; and there is some fear that all of the logs will not be brought safely to the mills, because the quantity of snow in the woods has been smaller than usual, and this may affect the driving on the streams. Some fear was expressed that there would be a shortage in brick for construction work, but the brick yards are beginning operations earlier than usual, and Nova Scotia may also be able, as it was last year, to furnish some supplies, while representatives of Glasgow concerns have been making enquiries with a view to sending shipments here.

There is likely to be a very active demand for skilled labor, and in St. John at the present time there is some anxiety among builders over an agitation for an eight-hour day. Their claim is that the time is not opportune for such a movement, which has been started by some of the labor unions, and contend that the adoption of an eight-hour day would tend to restrict building operations in the city at a time when there is great need of increased housing accommodation for an increasing population. The question can hardly be said to have reached an acute stage.

Aside from what may or may not be done by individual enterprise, there will be a great deal of heavy construction work in New Brunswick this year, by the provincial and federal governments, the Canadian Pacific Railway Company and several large corporations who are enlarging their operations for engaging in the development of new resources. The American capitalists who propose to develop power and construct suburban street car lines in several directions out of St. John have their engineers at work beginning the survey, and state that they will proceed with construction work during the summer.

The demand for labor generally will, of course, be large. It has been intimated by contractors that five thousand more men will be required in St. John and its suburbs when the general construction work is in full progress than have been employed during the winter. If all the logs come out, there will be greater activity in the lumber industry than there was last year. A number of sawmills at St. John and in other parts of the province are already at work, and it is anticipated that there will be much less lumber held over next fall than was the case last fall, although the latter supplies have been largely shipped during the winter either to the United Kingdom or the United States. It is an interesting fact that a large and steadily growing market for New Brunswick spruce lumber has been developed in the Montreal district and Eastern Ontario, some kinds of lumber going as far as Toronto and London. The demand from the Montreal district is especially active, and there are now some mills in the northern part of the province which devote themselves chiefly to manufacturing for that market.

Premier Flemming recently predicted that within five years there would be from ten million to fifteen million dollars invested in pulp and paper mills in New Brunswick, giving employment to thousands of men. There are two big projects, one at Grand Falls on the St. John River, in which Sir Wm. Van Horne is largely interested and for which the plans are nearing completion, and another at the Great Falls of the Nepisiguit River near Bathurst, where the Bathurst Lumber Company are endeavoring to float an enterprise involving five or six million dollars for the development of power and the erection of pulp and paper mills. Whether any of these large pulp and paper projects will take shape this year to the extent of beginning development work is not yet announced. There are other projects relating to the development of iron, coal and clay products which may arrive at a practical stage; but, apart altogether from these, the year will be one of exceptional activity in building and construction work, with a lively demand for labor and supplies.

In addition to the new post office which is being erected in St. John the contract has just been awarded for a new post office at Fredericton, to cost $133,000, the contractors being Falconer & MacDonald, of Halifax.

Building News from Winnipeg

Trade Increasing Rapidly in Every Department — Many Permits for Houses — New Bridge Now Proposed

Correspondence of The Contract Record

Winnipeg, April 4, 1913.

WITH the arrival of the spring break-up and mild weather, there is a decided increase in the amount of building operations in sight. The two-million-dollar mark in the year's permits was passed on March 28th. Among the number of the larger permits taken out recently was one by O. Peterson for an apartment block on Maryland street, which will be a three-storey brick block and will cost $65,000. Another permit was for a $60,000 apartment block which was taken out by the Superior Builders Company for a three-storey brick block to be erected on Tache street. Permits for dwelling houses continue to be taken out in large numbers. Recently the West End Realty and Building Company took out permits for 38 houses, to be built in the western part of the city, the total amount being $158,000. J. Parker also took out permits for fourteen houses at a value of $42,000.

The exterior work has just been completed on a three-storey addition to the storage warehouse of the Richardson Company on Kate street. This building is a large brick structure with fireproof characteristics. The exterior is of yellow pressed brick.

Smith street is the scene of most of the building operations in progress at the present time. The excavation for an office building, on the west side of the street just north of the rear of the new Sterling Bank building, is nearing completion. Directly across the road there is another large gang at work on the excavation for a building at the rear of the Olympic Cafe.

The corner of Smith and Graham is a very busy place. On the northeast corner a large gang is at work on the excavation for the new Tribune Building. A steam frost excavator is being used to good advantage on this work. This machine consists of a big steel chisel about six feet long on the head of which a weight drops. About half a cubic yard of the frozen earth was being cut off at each blow of the hammer.

On the southwest corner, the dwelling houses are being removed to make room for a four-storey building to be erected for the Knights of Columbus. The ground storey will be divided into stores and the floors above will be occupied by the society. Messrs. John D. Atcheson & Company are the architects.

On the northwest corner, the new Sunday School of Holy Trinity Church has just been completed and the property on the southeast corner has been purchased as a site for the new Grace Church.

Thomas Kelly & Sons have been awarded the contract by the Board of Control for the construction of a trunk sewer on Clifton street, from Sargent avenue to Richard ave. This is a length of 2,550 feet. The sewer will be constructed of concrete, with dimensions 7 ft. 4 ins. by 5 ft. 8 ins. It is estimated that this sewer will take care of the drainage from about 800 acres.

There has been considerable discussion between the councils of the cities of Winnipeg and St. Boniface in regard to the erection of a new bridge between the two cities at the foot of Provencher avenue, St. Boniface. A subway under the tracks of the Canadian Northern Railway would have to be built on the Winnipeg side and this would increase the cost and difficulty of making the approach on this side. It is likely that work will be commenced on this bridge next year. L. R. M.

Double Tracking Between Calgary and Vancouver

THE work of double-tracking the Canadian Pacific Railway between Vancouver and Calgary is now in progress on the western end of the line, and construction will be begun at several points in the mountain divisions, it is stated, early in the spring. Better gradients are to be secured at the same time that double trackage is provided, and for this reason it is necessary to abandon the present route entirely in some places. Changes in the route across the Selkirk Mountain range will shorten the line about 3 miles, and will involve the construction of a tunnel 5 miles in length to eliminate the present summit crossing through Roger's Pass.

For the major portion of the mileage between Calgary and Vancouver the proposed changes will give a maximum gradient not exceeding four-tenths of 1 per cent., the exceptions being on the grades to the summits in the Selkirk and Rocky Mountain crossings. The spiral tunnels in the Rockies between Hector and Field, B.C., which have a maximum grade of 2.2 per cent., will still be used, other spiral tunnels being driven to provide for the second track. The spiral tunnels now in use were described in the Engineering Record of September 25th, 1909.

In the Selkirk Mountains a route with better grades than those now in use has been located by the recent surveys. Westward from Six-Mile Creek the present route, which ascends the side hills of Beaver River Valley and follows its tributary, Bear Creek, to the summit in Roger's Pass, will be abandoned altogether to secure a **maximum grade not** exceeding 1 per cent. The new line follows the bottom of the Beaver River Valley to the eastern portal of the proposed tunnel, which will do away with the grade up to Roger's Pass and incidentally eliminate 4 miles of snowsheds. The western portal of the tunnel will be a few miles below Glacier in the valley of the Illecillewaet.

It is expected that the grade through the tunnel will not be much in excess of 1 per cent. In addition to the grades exceeding four-tenths of 1 per cent. which have already been mentioned, there will be one other exception to this as a maximum gradient, which will be in that part of the line between the western portal of the tunnel and Revelstoke. Here the line often skirts the brink of the Illecillewaet Canyon, and great difficulties would attend grade alterations at many points.

The cost of the proposed route changes, double-tracking and driving the tunnel is estimated at about $150,000,000, and at least 4 years will be required to complete the work. Mr. F. F. Busteed, formerly general superintendent of the British Columbia division of the Canadian Pacific Railway, is in immediate charge of the work, with headquarters at Kamloops, B.C.

Montreal Builders' Exchange

The question of fire prevention was discussed at the noon-day luncheon of the Montreal Builders' Exchange, on March 27th. Mr. W. E. Findlay, who is a member of the National Fire Prevention Association, was the chief speaker, He said that three dollars per head or fifteen dollars per family was the average annual charge laid on the people of Canada through fires, a large percentage of which were preventible. Insurance did not cover all the waste and it was still more important to remember that what was destroyed by fire was a dead loss. The person covered by the insurance policy might be recouped, but the funds to pay him came out of the pockets of the community, to which must be added the running expenses of the companies. Further, this did not take into account the loss of time to employees of burned-out firms nor the loss to such firms through the enforced idleness of property, plant and machinery, and the shrinkage in business in the interval before goods could be got out to customers again.

Carelessness was the principal cause and filth was the glass windows, were like a fire-wall, and the down-town district, where these buildings were, was much safer from conflagration than fifteen years ago. He placed wired glass ahead of water curtains in respect to the prevention of the spread of fires.

Mr. Tremblay, chief of the fire department, in moving a vote of thanks, said that he had years ago seen the need of preventive measures in Montreal if the number of and losses by fires were to be reduced. He read a statement to show how fires had decreased since 1907 in proportion as inspection had increased. Instead of spending three quarters of a million dollars on fire protection, he advocated spending less on this head and as much as possible for preventive work. The civic authorities had begun to make appropriations for preventive measures, and he hoped this would be increased annually. Many people did not care so long as they were insured. In his opinion the premises in the case of sixty per cent. of fires, were over-insured. Seven and eight storey buildings in the congested district were a great source of danger if they carried large stocks of inflammable goods and if the windows were of wood fitted with ordinary glass. He endorsed what Mr. Findlay had said about the value of wired glass in relation to fire prevention. The windows, however, should have metal frames and sash, otherwise the wired glass would not avail much. Mr. Tremblay recommended sprinklers as a great protection.

Mr. A. Chausse, building inspector, in seconding the vote of thanks, [illegible]

[illegible] inspection was as necessary [illegible] Rules must be enforced, and the staff for the purpose was totally inadequate. He hoped the new building by-law would contain helpful regulations in regard to smoking in offices.

Mr. W. Galbraith, and the chairman, Mr. T. Gilday, also spoke.

Montreal Harbor Commissioners' Report

THE Montreal Harbor Commissioners have now decided on their programme for 1913, involving an expenditure of over $2,000,000. The principal work is designed to decrease the velocity of the St. Mary's Current, which will involve a large amount of dredging and the removal of the artificial works at Moffat's Island. It is proposed to continue the development of the embankment at St. Lambert, with a view of its finally being incorporated in the Harbor railway terminal system. The present embankment at St. Lambert has been built with the debris taken by the excavator buckets from between Moffat's Island and the opposite bank.

With a view to accommodating the larger steamers, the Alexandra, King Edward and Jacques Cartier piers are to be extended a further distance of 250 feet. This work, however, will not take place until the dredging at the Guard pier has been completed and the locks at the entrance to the Lachine Canal altered. A 15-ton electric freight hoist capable of taking teams up to the second floors of the Allan and White Star sheds is to be erected at once. A contract has already been let for the addition to the grain elevator No. 1, while grain elevator No. 2 will have its conveyor galleries completed.

The quayage of the Victoria Pier is to be completed, making a total distance of 900 feet, while another length is to be constructed at right angles to it, but this will not be finished until the end of 1914, when there will be a total length of 1,800 feet. These extensions will provide accommodation on the outside for five ocean steamers. In section 23 a large warehouse is to be erected, together with high level bulkhead wharves suitable for permanent sheds. Other high level wharves are also to be erected for the accommodation of first class ocean liners. The large warehouse referred to will be for the provision trade, and it will be connected with the Harbor Commissioners' railway. Two sheds will be built on the Tarte Pier, making four altogether. The high level tracks to the Racine Pier will be ballasted and made permanent. At Pointe-aux-Trembles a 500-foot wharf will be built for the Canada Cement Company and other concerns.

More work will be done in connection with the site of the floating dock, the Duke of Connaught. The dry dock site is to be completed to proper levels so that the Canadian Vickers Company can erect the large machine shops and ship repairing plant they have decided to build. The wall adjoining the slipway is to be removed in order to allow of the slipway being enlarged to double its capacity, thus enabling ships of much larger size to be constructed.

An important policy recently decided on by the Highway Commission of Saskatchewan was the inauguration of a competition to improve the public roads of the province. By this policy they will offer $4,000 in prizes for competition among the different municipalities for the best section of from two to four miles of road they construct this year. For the competition, the province will be divided into ten sections, each comprising an equal proportion of the municipalities and each section will be considered as a competitor. The highway board, of course, reserves the rights to cancel the competition if the number of entries is not large enough.

Gravity System of Pouring Concrete

THE great amount of concrete work done within recent years, and the future prospects for its increase, has brought forth from time to time new ideas of handling concrete both with a view to economy and to gaining a superior mixture.

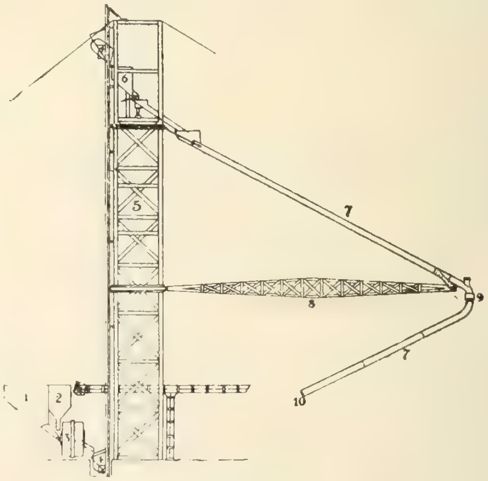
Among these ideas is the gravity system of pouring concrete, which will undoubtedly, as time goes by, be used on all concrete work of any magnitude. The system as devised and patented by the Concrete Appliance Company, of Los Angeles, Cal., is the outcome of experiments in actual practice, and consists of troughing supported by a boom, at the nose of which is a free-end swivel trough, so that any part of a horizontal plane can be reached.

Complete plant consists of storage bins from which the sand, gravel and cement runs into a measuring hopper, which empties into a mixer. The mixed concrete is dumped into a skip running up and down a tower, to which is fastened the boom supporting the troughing.

The area that can be covered depends on the length of the boom. With a boom over 60-ft. long an intersecting gate is used to reach near the tower. Booms have been used up to 100 feet in length when it was impossible to put in subtowers, but where sub-towers can be used it is not advisable to use booms over 70 feet in length.

The towers are built so that the sleeve to which the boom is fastened can slide up and down on the outside of the tower, the sleeve being raised with a hand crab or the hoist that raises the skip.

Different shaped troughing and different sized pipes have been experimented with, and it was found that the most satisfactory was a 7 or 8-in. pipe, or an 8-in. trough having open trough swivels and open trough free end. The pipe is the lighter, and therefore the easier handled, but where the men are not familiar with its use it may clog, and for that reason it has been found best to use the open trough.



Detail of system.

Concrete has been run successfully through troughs from 7 to 45 degrees with the horizontal, dropped vertically and redistributed. The best angle and one generally used is 18 degrees.

The rate of flow of concrete was determined for practical reasons by Messrs. Uhden & Turner, engineers for the Washington Water Power Company, Spokane, Wash., and it was found that through a round opening of 7-in., emptying into a 8-in. trough at an inclination of 18 degrees, mixed concrete of the proper consistency ran at the rate of 132 cubic yards per hour.

The use of this system has demonstrated that economy is practical only when the installation consists of boom fastened to tower, and rotating about same, supporting a trough and swivel and discharge of free end. All the apparatus pertaining to the distribution of the concrete is above the operating floor, and on account of its large capacity it has developed ingenuity on the part of the contractor in constructing storage bins and loading devices to increase the output of the mixer.

Doubts may exist in the minds of many as to the homogeneous mix at the outlet of the trough, but personal observation by many who have doubted have convinced them that the mix is superior to that obtained with barrows or carts. The concrete is being mixed from the time it enters the mixer until it leaves the trough, and being delivered in a small stream, is especially adapted to pouring thin walls and columns in which there is a large amount of steel. With the barrow, cart, bucket or car, the dumping of a large mass is apt to bridge over or "pocket," and wash itself when dumping, producing a variable mass, and there is less assurance of dense and solid formation inside columns and girders.

Although it has been demonstrated that a fairly dry mixture, well tamped, will be stronger than a wet mixture, in actual practice it is impossible to give a fairly dry mix the proper care and attention, and under existing conditions a wet mixture is found much more reliable; less tamping is needed, and it will be found that it has less voids, and as time elapses its strength approaches that of the drier concrete. In reinforced concrete it is much better to have a reliable concrete than to attempt to get the maximum strength so that a plastic concrete which flows around the steel should be used.

The oily nature of the cement makes the concrete surprisingly slippery and it flows readily through troughs on a smaller slope than would seem possible to one not familiar with it. The mixture should have enough water so that it runs like a thick gravy, and the rock be held in suspension. The mixture will flow readily in this condition, and will show no excess of water when dumped in the skip.

Some of the advantages of this system are as follows:

1. The obtaining of the initial set of the concrete on account of its rapid handling and continual movement until it leaves the trough.

2. The making of a uniform, homogeneous mass and the prevention of the segregating of the materials.

3. The flexibility of the system is such that it can be used on any structure, from the simplest foundation and dam work to the most complicated dome, columns and frieze work.

4. The use at all times of a standard equipment for the entire process of mixing, transferring and pouring. The same equipment is used for all classes of work, the only change necessary being in the length of boom.

5. The equipment is clear of the working floor, and therefore does not interfere with any other work such as the laying of steel.

6. The eliminating of scaffolds and runways and their resulting evils, such as the displacing of steel and breaking of tile.

7. The handling of large quantities, the output being limited only by the mixing and hoisting capacity of the plant. When the contractor has [illegible] and has good mixing and hoisting equipment, it is not uncommon to average 30 yards per hour on buildings. Recently on a large reinforced building in Los Angeles the Engstrum Construction Company used two skips on a tower, delivering a little better than 40 cubic yards per hour with no increase in the number of men, so the possibilities from an economic standpoint are readily apparent. This system was used by the Norton Griffiths Steel Construction Company on the Birks Building in Vancouver, and averaged better than 30 cubic yards per hour on some of the floors.

In conclusion, a system which produces a better concrete at a smaller cost should receive the careful attention of every contractor.

Mainly Constructional

The News in Brief—From Coast to Coast

An appeal has been made to clay products firms in Canada for help for the sufferers from the Ohio floods.

From estimates received, it is anticipated that building permits in Saskatoon will exceed $5,000,000 this year.

Building permits for the month of March at Hamilton, Ont., amounted to $486,950, an increase of $46,450 over March, 1912.

A revised building by-law recently passed by the Toronto Council has fixed the maximum height of buildings at 130 feet.

The McLeod Building at Edmonton is expected to be ready for occupancy by the end of December. The total cost of construction will be $600,000.

A new Masonic Temple is to be erected on Spadina Road, Toronto, at a cost of $250,000. $155,000 of this has already been subscribed by the different lodges.

For the month of March the Montreal building permits totalled $761,550, an increase of $80,101 over last year; the total for the three months was $1,867,847, a gain of $446,688.

For the first three months of this year permits to the amount of $100,000 were issued for buildings in Kingston, Ont., as compared with $25,000 for the same period of last year.

The value of the new buildings for which permits were issued last month by the City Architect at Toronto, was $1,980,960, as against $1,557,750 in March, 1912, an increase of $423,210.

On May 6, the ratepayers of the city of Winnipeg will be asked to vote on the by-law authorizing the expenditure of $1,250,000 for the construction of a subway under the C. P. R. tracks at Salter street.

Great building activity is expected to take place at London, Ont., shortly. Many residences have been planned and the McCormick Company will shortly start the erection of their new factory.

The Hon. F. Cochrane, Minister of Railways & Canals, has promised to give serious consideration to the request of the [illegible] that the new Welland Canal be [illegible]

Works Commissioner Harris recently estimated that the waste of water in Toronto has been at the rate of 389,455,000 gallons a year, and it has been costing the city $17,320 a year to pump this.

Messrs. Brown and Hargreaves, of Edmonton, have received a contract to erect a 17-roomed school building at a cost of $149,943, on the Hudson's Bay reserve. The structure will be of stone with concrete floors.

The council of Edmonton at an adjourned meeting adopted a by-law providing for the raising of [illegible] to pay for the extension of the municipal sewer service system, payable by the city at large. Work will begin this spring.

Messrs. [illegible] have taken out permits for 16 residences, costing from [illegible] the [illegible] estate in Edmonton, which has been divided as a residential district. Work will begin shortly.

The Y. W. C. A. has definitely decided to erect a new building on the north side at Regina. The city council has been asked to grant a site for the building, and it is understood the request will be granted.

Mr. T. Aird Murray, C.E., Toronto, has submitted plans for a $60,000 sewerage disposal plant for the city of Peterborough. The city is threatened with litigation if it continues to discharge sewage into the Otonabee River.

The Montreal Council have voted $8,000 for the appointment of an expert to advise on the best method of the treatment of sewage which will drain into the Back River. The Council desire a system suited to the city's climatic conditions.

The dumping of snow into the Montreal sewers this winter has proved a great success, according to Mr. G. Janin, the chief engineer. There has been a saving of $40,000 in haulage. Next winter the snow will be carried to the sewers in motor trucks.

A deputation from Prince Albert arrived in Regina recently to wait on the Government to request the erection of a new bridge over the Saskatchewan River, at Prince Albert. The present bridge, it is claimed, is not strong enough to meet the demands upon it.

The Siemens Company of Canada received the order for a 1500 kw. turbo-generator for the city of Moose Jaw. The machine will run at 3,600 r.p.m. and be suitable for 3-phase, 60 cycle circuit. The generator will be direct coupled to Willans & Robinson's steam turbine.

Mr. G. Janin, chief engineer of the city of Montreal, has been requested to prepare a plan of organization of a new department, to comprise the building inspector's staff, that of the Boiler Inspector's, and of the inspection of plumbing, as well as the control of all municipal buildings.

Mr. Andrew Carnegie has announced an offer of $13,000 to Brantford, Ont., for an addition to the Public Library. A few years ago Brantford accepted a Carnegie gift of $30,000, but the library built has proved inadequate. The extensions planned include provision for a technical works branch.

Mr. R. H. Knight, of Edmonton, of the firm of Driscoll and Knight, surveyors, has submitted a drawing for a new civic center scheme to be worked out in the heart of the financial and commercial district. The land required for city purposes is valued at $2,000,000, payments being spread out over forty years.

Work has already started on the construction of the two new theatres at Toronto. The Shea Theatre people are excavating on Teraulay street, opposite the city hall, and the Marcus Loew syndicate will start actual construction this week. About three hundred thousand dollars each will be expended in construction.

Mr. W. B. Sherman, owner of the Empire and Lyceum theaters, announces that work on the new Sherman theater in Edmonton will begin this month with a view to having it in readiness for next fall. The structure will be ten storeys with full basement. Part of the house is to be used for hotel and store purposes.

Mr. P. Tompkins, president of the Board of Trade at Grouard, Alta., at the head of Lesser Slave Lake, said while in Edmonton on a buying trip, that building operations will be active there this season. The programme includes stores and residences, a high bridge across the Narrows, to be built by the Provincial Government, and two steamships for lake service.

Messrs. Hardie & Marland's plans for a $75,000 structure and a rectory costing $8,000 at Edmonton, have been accepted by the officials of the Catholic Church, and it is announced that bids will be called for shortly. The building will be known as the Church of the Sacred Heart. It will be of Gothic construction, the highest tower being 130 feet. The auditorium and gallery will accommodate a thousand, and the full basement will be utilized.

Two hundred engineers, divided into four divisions, have left Calgary for survey work on the eastern section of the C. P. R. irrigation block. Three of the divisions will operate in the Brooks district and one at Bassano. By the time the frost is out of the ground the contractors will be able to resume work on the irrigation project, and about twenty-five hundred men will be engaged on construction work. The work will be conducted on a larger scale than last year, and it is anticipated the end of the year will see the greater part completed.

At the request of the Attorney General, City Engineer Rust, of Victoria, will assist Mr. R. H. Thomson, the latter acting for the Provincial Government, in examining into the drainage problem of Greater Vancouver. It is the intention of the government to guarantee the bonds which will be issued to permit of the installation of a comprehensive system of sewerage for that section and it is imperative that the government secure the best available advice, it therefore desires that Mr. Rust be associated with Mr. Thomson in this work.

The estimated cost of works for the Montreal harbor improvements to be undertaken by the commissioners this season is over $2,000,000, and the programme which has been drawn up includes works which will have the effect of diminishing the velocity of the St. Mary's current, and making its navigation perfectly safe in the near future. The programme of works this season marks the commencement of the second stage of the great plan for the improvement of the port which is to extend over a period of 12 years from its inception three years ago, the first stage having been commenced in 1910.

Mr. R. H. Thomson, formerly city engineer of Seattle, Wash., now engineer in charge of Strathcona Park, for the Province of British Columbia, and Mr. C. H. Rust, City Engineer of Victoria, B.C., have been requested by the Provincial Government to report upon the proposed sewerage scheme for Greater Vancouver, recently submitted to the various municipalities interested, by Mr. R. S. Lea, of Montreal. The government has agreed to guarantee the interest upon bonds to the extent of five million dollars, this being the amount that Mr. Lea recommends should be expended at once. The remaining five million dollars will be spread over a period of some years.

The Master Painters' and Decorators' Association of Montreal on March 29th held a dinner at Cooper's Restaurant, Mr. W. E. Potter, presiding. Among the speakers were Messrs. T. Lester, W. T. Castle, J. H. Lauer, J. A. Naud, Joseph Thibault, H. T. Hubert, George Haysey, and T. Gilday. The main topics of the speeches were the strength of the association, owing to the efforts of the president, and the threatened strike of the men, who have just been conceded a 10 per cent, rise in their pay. A minimum of 40c an hour was asked for, but the association declined to give this, and refused to recognize the union, claiming to pay the men according to their ability.

Two million dollars is about to be spent by the Highways Commission of the Provincial Government in the province of Saskatchewan during the coming summer for roads and bridges. Considerable attention will be paid to the construction of bridges and it is expected that between thirty and forty steel frame bridges, with concrete piers, and between 300 and 400 wooden trestle bridges will be built. Contracts have been let for some of these, and tenders will be called for the remainder very shortly. Tenders for the proposed new $400,000 bridge at Saskatoon will be called within a month. This bridge will be 1,540 feet long, of reinforced concrete, and it is expected will take about two years to build.

The Missisquoi-Lautz Corporation, Limited, has been formed under a Federal charter, with a capital of $1,500,000. The following are the officers of the company: Messrs. H. W. Richardson, president, Kingston; Henry Timmis, vice-president, Montreal; Fritz J. Lautz, managing director, Philipsburg, P.Q.; W. J. Morrice, Montreal; R. J. Dale, Montreal; and Jas. Playfair, Midland. The company have quarries at Philipsburg, P.Q., and sawmills and finishing plants at Philipsburg and Bridgeburg, Ont., and will handle foreign marbles of all descriptions, as well as the product of their own quarries. The facilities represent about 75 per cent. of the marble finishing capacity of Canada. Mr. Fritz J. Lautz will take over the active management by the middle of the present month, and will reside at Philipsburg, where the head office of the company will be situated. Operations will commence with about $600,000 of signed contracts, and over another million dollars worth of work for which Missisquoi marble has been specified.

Canadian Railroad Development

The Canadian Pacific Railway Company has awarded a contract for $25,000 to the Carter-Halls-Aldinger Company as its share of the Fifth street bridge over the tracks. The city's share is estimated at $35,000.

Messrs. Macdougal & McCluskey, Cochrane, Ont., have been awarded the contract for constructing seven miles of line for the Temiskaming & Northern Ontario Railway, from the main line to Iroquois Falls in the Abitibi River.

It was announced recently that the Toronto-Ottawa line of the Canadian Northern Railway would be completed in a few weeks' time and ready for the establishment of a freight service before the end of this month. The passenger service is to follow the latter part of May.

It has recently been stated that the Canadian Northern Railway will employ one thousand men at Leaside within fifteen months, and that shops will be established there for those portions of the system from Toronto to its eastern terminal and from Toronto to the west as far as Port Arthur.

The Canadian Pacific Railway has opened its new shops at Ogden, near Calgary, which are the largest railway repair shops in the world. Between five and six hundred men are now employed in the shops, but it will be about four months before they are in full working order, when it is expected that fully two thousand five hundred men will be found employment.

Announcement is made that the Canadian Pacific Railway Company will erect a hotel building at Edmonton at an initial cost of $2,250,000, on its property at Ninth street and Jasper avenue, where the big passenger station is now under construction. The report says that the Montreal firm having charge of the company's hotel construction has consulted with architects in Edmonton regarding plans and specifications.

The Foundation Company, Limited, Montreal, have received a contract for the sub-structure of the Mud Lake Bridge, near Maberley, Ont., on the C. L. O. & W. line of the C. P. R. The work consists of [illegible] piers and two abutments; two of the former are on pneumatic caissons, one of which will go to a depth of 102 feet 6 inches below water level, and is probably the deepest in Canada. The work is under the direction of Mr. C. W. P. Ramsey, engineer of the construction department of the C. P. R.

According to the latest information the Canadian Pacific Railway is to carry out some very extensive improvements at Winnipeg during the coming summer. It is understood that the changes will involves a great deal more labor and expense than was originally intended. It is proposed to raise the tracks in the depot from six to eight feet, and to insert two extra tracks, making ten in all. It will be necessary to widen the subway over which the present eight tracks pass in order to erect the extra ones.

The policy of the Canadian Pacific Railway in double-tracking its system throughout the west is proceeding apace and the latest information from Port Coquitlam is to the effect that the double track of the C. P. R. between Pitt River and Port Hammond on the main line is now in operation. The double track system is now in use from Vancouver to Hammond, with the exception of Pitt River Bridge Crossing, at which point a new double track bridge is now under course of construction. It is expected that by the end of the year double tracks will be in operation between Vancouver and Ruby Creek, a distance of eighty-one miles.

Red Deer is now becoming a big railway centre and the business of the Canadian Pacific Railway is growing rapidly. Additional trains are being stationed at this place to handle the traffic on the Lacombe to Moose Jaw line, which is being operated direct from this point to Coronation, the first divisional point east of Lacombe. Work teams are to be put on at once to ballast the Lacombe branch and as soon as the spring opens the work will be rushed on laying the steel to Rocky Mountain House, as the C. P. R. intend to have a regular service by midsummer. It is expected that some of the line east from here on the Alberta Central charter will also be built this year as the C. P. R. have filed plans for the first ten miles east from Red Deer.

Sir Richard McBride, premier of British Columbia, will go to Washington shortly to interview President Wilson with regard to the possibility of co-operation between the British Columbia Government and that of the United States in extending the Pacific Great Eastern Railway by main and branch lines from Fort George on the Grand Trunk Pacific through Alaska, tapping the principal mining camps. It is proposed to extend the P. G. E. Railway through the undeveloped portions of Northern British Columbia and the Yukon, as well as providing Alaska with railway transportation. Sir Richard is said to be enthusiastic as to the possibilities of the project, which will open up enormous areas to mining and agricultural development and will create a railroad system with a mileage of some 3,000 miles. It is understood that the co-operation of the Federal Government will also be sought and Sir Richard may proceed to Ottawa from Washington for that purpose.

The Western Canada Power Company, Vancouver, about whose contract with the British Columbia Electric Railway for the supply of power we have informed our readers recently, have placed the contract for two 13,000 h.p. Double Francis Turbines with Messrs. Escher Wyss & Company, Montreal, these units to be installed at an early date. Escher Wyss & Company will, at the same time, supply two Inlet Drum Gates. The dam at Stave Falls will be raised to elevation [illegible] so as to create additional storage [illegible] in the Stave River and the Stave Lake. A second installation, about three miles down stream, will be taken in hand shortly and a further [illegible] h.p. will be developed there.

Personal Mention

Mr. R. H. Parsons, assistant city engineer of Ottawa, has been appointed city engineer of Peterborough, Ont.

Mr. Ernest Brown, an architect of Regina, Sask., has been appointed Deputy Minister of Public Works of the Province of Saskatchewan.

Mr. E. St. Louis, at one time a prominent contractor in Montreal, is dead. He was at one time in partnership with his brother, Mr. J. E. St. Louis.

The City Council of St. Thomas, Ont., recently appointed Mr. Mellis Ferguson, late City Engineer of Guelph, as City Engineer at a salary of $2,000 per year.

Mr. Chas. H. Dancer, Deputy Minister of Public Works for Manitoba, is recovering from an attack of rheumatic gout, which has laid him up for some months past.

Mr. C. W. Laing, Chief Engineer, The Brown Machine Company, Limited, New Glasgow, N.S., left on March 21st for a trip through the West in the interests of the company.

Mr. Arthur Skidmore has been appointed chief of the Grand Trunk power house at the Stratford shops, in succession to Mr. A. Kastella, who has been transferred to Ottawa.

Prof. Arthur H. Blanchard, professor of highway engineering at Columbia University, has been appointed by Governor Sulzer a member of the Advisory Commission on Highways for the State of New York.

Mr. Charles Forrester has been appointed Superintendent of the Grand Trunk Railway, with headquarters at Stratford, Ont. Mr. Forrester began his railway work as a telegraph operator, and until recently was Trainmaster at Strat-

Mr. Jas. Cowin, who has been in charge of the Winnipeg office of Mr. C. A. P. Turner for the last two years, is leaving the western metropolis to take charge of the Texas agency. Messrs. A. W. Fosness and S. J. Sieverson, from the main office in Minneapolis, will take charge of the Winnipeg work.

Mr. J. L. Doupe, chief of the land department of the C. P. R. Natural Resources department, has been appointed chief surveyor of the operating and maintenance of way department of the railroad. Mr. Doupe's work will include the preparation of plans and descriptions for the purchase, sale and lease of lands, re-surveys of right of ways, surveys of other lands, and all such surveys as come within the jurisdiction of the operating department.

Mr. Peter S. Archibald, consulting engineer, of Moncton, N.B., died at his home in that city last month. He was born at Truro, N.S., in 1848, and educated at the Truro Normal School. He was Assistant Engineer of the Intercolonial Railway from 1869 to 1879 and Chief Engineer from 1879 to 1897, when he retired to private practice as a consulting engineer. He also served as Commissioner of Railways for the New Brunswick Government and as Manager of the Elgin & Havelock Railway. Mr. Archibald was a member of the council of the Canadian Society of Civil Engineers.

Mr. J. J. Conlin, formerly Engineer for the R. & O. Navigation Company, also connected with Ross & Greig and The Garth Co., is now President and General Manager of the General Manufacturers' Agencies, Limited, with head office at 515 New Birks Building, Montreal. This firm is the Canadian agent for Kieley & Mueller, high grade steam specialties; the Thermograde System of heat regulation; the Van Auken system of vacuum control; Benj. F. Kelley & Son's heaters and the Massachusetts Fan Company. They are also handling the Shone system of sewage ejectors as applied to both buildings and plants; steam and power pumps, filtering systems, sanitary individual washbowls, metal lockers, racks, and steel tanks of all descriptions.

A New Firm of Consulting Engineers

The F. W. Thorold Company, Limited, recently incorporated as consulting contractors, have taken offices in rooms 42 and 43 at 2 Toronto street, Toronto.

The principal of the company is F. W. Thorold, B.A.Sc., M. Can. Soc. C.E., who is well and favorably known among municipal engineers all over Canada.

Mr. Thorold is a Canadian and has had an extended experience in municipal engineering and contracting from the Atlantic to the Rockies. He received his early training under Mr. Willis Chipman from 1899 to 1902 and was City Engineer of Calgary from 1902 to 1906, since which time he has been Chief Engineer on the design and construction of several sewerage, water and electric light systems and other public improvements in the west. Mr. Thorold came east after the 1907 "slump" and acted as Chief Engineer, under City Engineer Rust, in carrying out the preliminary investigations of sites and the final surveys, design, plans and specifications for the Morley avenue sewage disposal works and the huge outlet into Lake Ontario for the city of Toronto. The principle of the Morley avenue disposal works was adopted on the recommendation of John D. Watson, of Birmingham, Eng.

Mr. F. W. Thorold, Toronto

During the last two years Mr. Thorold has been a partner in a local contracting firm, having contracts in Toronto, Hamilton, Whitby and other places.

The new company intend taking hold of all classes of municipal public works and will not only make the surveys and design of works, but will, when desired, construct the same complete, assuming responsibility throughout for the design and construction.

Mr. Thorold is very optimistic about the future of Canada. With his broad experience and favorable reputation as an engineer and contractor, he will doubtless make this new company, of which he is the head, a factor in the development of a great many of the towns of Canada.

Messrs. Johnson Bros., Port Hope, Ont., have been awarded the contract for the construction of the Lake Erie & Northern Railway.

A Sub-Contractor's Action

Mr. Justice Guerin, Montreal, has dismissed the case of Navest v. Marcotte, in which the plaintiff, a sub-contractor, sought to attach certain moneys in the hands of the city. The defendant secured a contract for building a city fire station, and the plaintiff did the painting and certain other work. He claimed that he had not been paid and had caused the seizure of certain sums in the possession of the city not paid to the defendant. The latter, in opposing the attachment taken out by the plaintiff, pointed out that the plaintiff had not provided himself with a certificate from the architect attesting to the fact that his portion of the work was completed. Plaintiff, on the other hand, in proof of the contention that the work was actually completed, pointed to the fact that the principal contractor obtained a certificate from the architect wherein it was stated that the work was practically completed, and on the strength of this certificate the principal contractor was enabled to collect from the city almost the full amount due him under the contract. He claimed that the architect's certificate issued to the principal contractor, defendant, covered the sub-contractor's portion of the work. Hence he demanded payment.

The contractor, in opposing the action, replied that the plaintiff had nothing to do with any arrangement or contract which defendant, as principal contractor, had entered into with the city.

His lordship in dismissing the application, said the point ought to be raised when the main action was fought.

LETTERS

The C.S.C.E. Discussion

Editor Contract Record:

I have been much interested in the editorials and correspondence relating to the Canadian Society of Civil Engineers. No doubt such a discussion is good for the Society and it is to be hoped that it will be of benefit to the Council and membership at large. That the management of the Society is subjected to criticism shows that we have a certain number of members who take a lively interest in the Society. When it is considered that the Council is so widely separated, one of the difficulties under which it works becomes apparent. Practically, it means that the greater part of the work is thrown on those Members resident at headquarters. There is no doubt that the individual member does not take as much interest in the Society as he should. The majority are not familiar with the by-laws; few write papers; not much attention is paid to voting; attendance at meetings is small.

That the time is rapidly approaching, if not already here, when we should have a Secretary devoting all his time to the work of the Society, is admitted by all. There can be no question that the Society owes Prof. McLeod a great deal for his work on behalf of the Society. The Secretary is a most important officer and a great deal of success of the Society depends upon him.

That Members of Council should be elected by the members residing in the district which they represent seems to be the opinion held by a large number of members. It seems certain that as time goes on the branches of the Society will become more and more important, and the financing of the branches is one of the present difficulties. If the Society is to remain one united, national Society, I believe it will be wise for the Montreal management to give more and more attention to the branches, especially those furthest from headquarters.

As to the employment of aliens, I think that the British subject resident in Canada should have an actual as well as a nominal preference, particularly in work carried out by the Government.

Yours very truly,

E. A. Stone.*

Garbage Disposal in Medium-Sized Cities

Editor Contract Record:

I was much interested in your recent account of a paper read by Mr. Samuel A. Greeley, before the Illinois Society of Engineers and Surveyors, as it deals with a subject of particular interest not only to engineers, but to most Canadian citizens.

Last year our newspapers occupied themselves in an extensive campaign aginst the fly. They organized a number of competitions by which they hoped to greatly reduce the numbers of these annoying insects, but the method adopted, namely that of encouraging children to go into all sorts of dirty places to find and kill flies, is a very dangerous one and should be discouraged. The fly would not be a harmful insect if it were not for the dirty eating and breeding grounds it chooses. The real remedy, therefore, is to see that garbage and other filth is not allowed to accumulate and remain exposed in and near our cities.

To do this in the best and most sanitary way is to compel people to have properly constructed garbage cans fitted with good covers, and for the city authorities to arrange to have the cans emptied and cleansed daily, the refuse being removed immediately to an incinerator.

Mr. Greeley has described several methods of disposing of garbage, and from a sanitary point of view I quite agree with him that the incinerator is the only satisfactory method at present used.

City authorities are apt to be tempted, on the ground of cheapness, to dispose of their garbage by dumping it, but after a little careful study of the relative costs, it will be seen that the difference is not great, and in the case of large communities it is decidedly in favor of the incinerator. One of the reasons for this is that considerably longer haulage is usually required to a dumping ground than to an incinerator placed in a central position in the city. Objection may be raised to the practice of allowing incinerators to be constructed in the centre of the city, but it has been shown in many cases that with a modern and well-designed incinerator there is no nuisance caused by the odours and smoke.

Mr. Greeley states that the high temperature incinerator is not economical for capacities of less than 45 tons a day of 24 hours. I am not able to agree with him in this contention, as I consider the high temperature incinerator has distinct advantages and is more economical for much lower capacities.

Take for instance a city which has to dispose of twenty tons of garbage a day. In a coal-fired incinerator, according to Mr. Greeley, the cost of fuel would be $1.00 per ton of garbage burnt, so that to destroy 20 tons per day the fuel bill would be $7,300 per annum. Now if a 40-ton incinerator of the high temperature type be used the capital expenditure would be about $30,000 and the plant would be worked only for twelve hours a day, so making ample provision for the future growth of the city. It will be seen from these figures that by the expenditure of $30,000, less the cost of a coal-fired incinerator, a saving of $7,300 would be made, justifying the larger capital expenditure.

Yours truly,

[illegible]

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* Consulting Engineer, [illegible]

[illegible] Consulting Engineer, Montreal.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Fort Erie, Ont.
Sewer system, cost $50,000, contemplated by the town council. Reeve, J. Douglas. Engineers, Wetmer & Brown, Buffalo, N.Y.

Hull, Que.
Waterworks, cost $50,000. Debentures will be issued for extension to watermains and plant, also for sewer improvements. Mayor, Dupuis. City Engineer, J. A. Laforest.

London, Ont.
Waterworks supplies. Tenders will be reecceived by Board until May 1st for 1,450 tons 4 in., 6 in., 8 in., 10 in. and 12 in. cast iron pipe; 92 valves and 20 tons tons special castings for the above; 75,000 lbs. pig lead, 64,000 lbs. lead pipe; 3,000 lbs. Russian jointing hemp. Specifications, etc., with H. J. Glaubitz, Gen. Man. Water Commissioners. Chairman Commissioners, Philip Pocock.

Listowel, Ont.
Council has decided to pave Victoria street and will shortly select the material and call for tenders. Mayor, Wm. Climie. Engineer, Thos. Blackmore.

Moncton, N.B.
Council wishes prices on 20 hydrants. City clerk, J. Edington.

Montreal, Que.
Two water tube boilers for City of Montreal. Secretary, L. N. Senecal, City Hall. Tenders received by Engineer Waterworks Dept. until April 15th. Specifications at City Hall.

Pavements and sewers, Westmount. Owner, City Council. City Engineer, Arch Currie. Tenders will be received by Sec.-treas., City Hall, until noon April 10th. Contract No. 12, paving Western avenue; contract No. 14, paving Atwater avenue; contract No. 15, paving Churchill avenue; contract No. 16, paving Clarke avenue; contract No. 17, sewer in Hudson avenue. Specifications at office of City Engineer, City Hall.

Sidewalks, planned by Board of Commissioners, City Hall. Engineer, Geo. Janin. Tenders received Secretary, L. N. Senecal, until April 11th. Plans and specifications at Road Dept., City Hall. Cement and asphalt sidewalks on a number of streets west of City Councillor street.

Purifying sewage plant, cost $8,000, in Notre Dame de Grace Ward, planned by Board of Control, City Hall. Engineer, Geo. Janin, City Hall. Tenders received by Engineer.

New Hamburg, Ont.
Town plans to install a complete new waterworks system and estimates will be secured shortly. Address David Eby, Town Clerk.

Niagara Falls, Ont.
10,000 yards brick pavement, Culp St. Mayor, C. C. Cole. Clerk, W. J. Seymour. Engineer-in-charge, F. J. Anderson. Tenders will be called.

Peterboro, Ont.
Sewage disposal plant, cost $60,000, contemplated by city council. Clerk, S. R. Armstrong. Engineer, T. A. S. Hay. Consulting engineer, T. Aird Murray, Lumsden Bldg, Toronto. Plans have been submitted.

Port Arthur, Ont.
Tenders received by Commissioner of Utilities, J. J. Hackney, until April 14th. 10,000 ft. 6-in. cast iron water pipe, 361 lbs. to foot. To be delivered by boat and rail as required. Certified cheque for 10 per cent. of tender to accompany each.

Sewer and waterworks material. Tenders will be received by Commissioner of Utilities, J. J. Hackney, up to April 14th for the following, No. 1 stranded salt glazed sewer pipe, sewer pipe fittings, "Trail" pig lead, cement, 36 strands untarred jute packing, lead pipe, soil pipe, square iron, clay picks, stable brooms, pick handles, Jones shovels, rubber hose. Edson trench pump, etc., "Mueller" pattern curb cocks and couplings, "Mueller" pattern stock cocks. List of quantities at office of Commissioner of Utilities, Port Arthur, and Contract Record & Engineering Review, Toronto, Ont.

St. Thomas, Ont.
Waterworks, cost $100,000, planned by city council. Mayor, E. N. Price. City engineer, M. H. Baker. Sec. Water Commissioners, S. O. Perry. Tenders will be called shortly for new 6 in., 10 in., 12 in. and 18 in. iron water mains, and large concrete or steel standpipe on Amelia street.

Toronto, Ont.
Cast iron pipe, for Board of Control. Tenders received by Mayor, H. C Hocken, until April 15th. Cast iron pipe 36 in. for Waterworks Dept.

Sewers planned by Board of Control. Tenders received by Mayor, H. C. Hocken, until noon, April 15th, for 14 sewers. Specifications, etc., at office of Sewers Branch, Dept. of Works, City Hall.

Pavements, curbs and sidewalks planned by Board of Control. Tenders received by Mayor, H. C. Hocken, until April 15th for number of pavements, etc. Material—Asphalt, Bitulithic, Asphalt Block, Concrete, concrete curbs and walks. Specifications at office of Roadways Branch, Dept. of Works, City Hall.

Welland, Ont.
Sewage treatment plant, planned by city council. Mayor, J. Goodwin. Clerk, C. N. Webber. Engineer-in-charge, J. Black.

Westmount
Supplies. Tenders received by Engineer, A. Currie, 21 Stanton street, until April 11th. Specifications with Engineer. Cement, sand, crushed stone, sewer pipes, bricks, paving blocks, farm tile, coal tar.

Winnipeg, Man.
Water meters, required by Board of Control. 2,500 water meters for domestic water service system. Specifications at office of Engineer, H. N. Ruttan, 223 James avenue. Tenders received by Secretary, M. Peterson, until April 28th, 1913.

CONTRACTS AWARDED

Montreal, Que.
Roadway. Dominion Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Messrs. Carpie & St. Georges, Montreal. The completion of Edward Seventh highway between Montreal and Rouses Point district, 16 miles.

Sasktoon, Sask.
Sewerage plant, cost $4,000, planned by City Council. Clerk, Geo. T. Clark. General contractor, Edmund T. Sykes, Neepawa, Man., and J. Browley, Fernie, B.C., for sewers, manholes, etc.

Winnipeg, Man.
Water pipe and valves. General contractors, The Canada Iron Corporation, Mark Fisher Bldg., Montreal, for cast iron water pipe, at $54,841. General contractors, T. McAvity & Sons, St. John, N.B., for valves, at $4,896.25. Board of Control. Secretary M. Peterson. Engineer, H. N. Ruttan, 223 James avenue.

Reservoir, cost $79,547.45, Logan Ave. General contractor, J. W. Astley, engineer-in-charge, City Yards, Winnipeg, for necessary plant and all labor required in construction of a reservoir having 18 million imperial gallons capacity. Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James avenue.

Railroads, Bridges and Wharves

Calgary, Alta.
Canadian Pacific Railway Company's plans and location of subway at Victoria Road has been approved.

Ceylon, Sask.
C. N. Rly. Co.'s location of station at Ceylon, Sask., has been approved.

District North Alberta, Alta.
G. T. P. Rly. Co.'s locations of stations at Irmie mileage 864.9, Sec. 28, 53-8 W-5-M and at Keston mileage 875.1

Sec. 26-53-10 W-5-M Dist. of North Alberta, Alta., have been approved.

Dist. of Fort George, B.C.
G. T. P. Rly. Co.'s has been authorized to construct bridge across Willow River, at mileage 1262 west of Winnipeg.

Kingston, Ont.
Harbor improvements. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, up to April 30th, for construction of a combined roadway and wharf across the Cataraqui River, and dredging in Kingston Harbor. Plans, specifications, etc., at office of J. G. Sing, Dist. Engineer, Confed. Life Bldg., Toronto, Ont., J. L. Michaud, Dist. Engineer, Merchants Bank Bldg., St. James street, Montreal, Que., A. R. Decary, Dist Engineer, Post Office Bldg., Que., Postmaster, Kingston, at Dept., Ottawa. Specifications also at office of MacLean Daily Reports, Toronto, Ont.

Montreal, Que.
C. P. Rly Co. has been authorized to construct subway across Papineau Ave., Montreal.

North Bay, Ont.
Station, cost $75,000, for Canadian Pacific Railway. Supt., T. T. Jennings North Bay. Plans being considered.

O'Brien, Que.
Round house, for Transcontinental Rly. 12-stall engine house without machine shop. Tenders received by Secretary, .P E. Ryan, Ottawa, until April 30th. Plans and specifications at office of Mr. W. J. Press, Mechanical Engineer, Ottawa, Ont., Mr. A. E. Doucet, Dist. Engineer, Quebec, Que., and Mr. H. M. Balkam, Dist. Engineer, Cochrane, Ont.

Ottawa, Ont.
Bridge, cost $130,000, Bank street, planned by the city. Acting city engineer, F. C. Askwith. Reinforced concrete construction. Existing bridge destroyed by flood.

Pugwash, N.S.
Tenders will be received by Secretary, L. K. Jones, Ottawa, Dom. Govt. Dept. of Rlys. and Canals, until April 10th, for construction of spur line extending from Pugwash on the Oxford Branch of the I. C. Rly. to Pugwash Harbour, a distance of 1½ miles. Specifications and plans at office of Chief Engineer, Dept. Rlys. and Canals, Ottawa, and at Engineers, office of I. C. R. at Moncton, N.B.

Prov. of Ontario
C. N. O. Rly. Co.'s location of stations at Davis, Twp. Davis, mileage 289.8; Janes, Twp. Janes, Dist. Nipissing, mileage 281.6, and Spaidal, Twp. MacLennan and Scadding, Dist. Sudbury, at mileage 298.36 from Ottawa, have been approved.

Prov. of Saskatchewan
C. P. Rly. Co.'s location of stations at Kelfield, Broadacres, Vanguard, Neville and Cloan in Prov. of Saskatchewan, have been approved.

Port Burwell, Ont.
Dredging. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dept. Public Works, until April 22nd. Specifications, etc., at Secretary's office.

Prince George, B.C.
G. T. P. Rly. Co.'s location of station at Prince George at mileage 467.3 Prince Rupert East in Indian Reserve No. 1 R. 4 Cariboo Dist. B.C., has been approved.

Toronto, Ont.
Canadian Pacific Railway Company has been authorized to construct two spurs for the Dominion Bridge Company, Limited.

Winnipeg, Man.
Canadian Pacific Railway Company has been authorized to construct two spurs for the city.

Subway, etc. C. P. Rly. Co. contemplates raising the tracks 6 or 8 ft. in front of the station. This will necessitate under track girder work and the raising and widening of the concrete under pass where Main street goes under the tracks.

CONTRACTS AWARDED

Edmonton, Alta.
Bridge, cost $60,000, planned by city council and C. P. R. Clerk, C. Cox. City engineer, A. J. Latornell. General contractors, The Carter-Halls-Aldinger Co., 1010 Union Bank Bldg, Winnipeg. For bridge over railway cut 66 ft. wide, 1 span 160 ft. concrete construction.

Fort William, Ont.
Round house, for Canadian Pacific Railway. Div. Engineer, I. C. Holden, Winnipeg. General contractors, Carter-Halls-Aldinger Co., Union Bank Bldg. Cement and piles, brick construction.

Toronto, Ont.
Bridge, cost $27,000, St. Clair avenue, for Board of Control. Mayor, H. C. Hocken. General contractors, Scott & Low, 705 Confed. Life Bldg. Concrete piers and abutments.

Public Building, Churches, Schools, etc.

Brandon, Man.
The building committee of the Hospital Board recommends building of New Maternity Hospital, extension of surgical wing, extension of nurses' home, all to cost $100,000. Clerk, Harry Brown.

Edmonton, Alta.
School, Westmount sub-division. Plans, specifications, etc., at offices of Public School Board. Tenders received by Secretary till April 17th.

Fort George, B.C.
Church and residences. Tenders received by Secretary till May 12th, for erecting on Reserve No. 2 Ft. George, B.C., 1 church, 11 large and 3 small dwellings for Indians, on Reserve No. 3 Ft. George, 6 large and 3 small dwellings for Indians. Separate tender to be submitted for church. Plans, specifications, etc., at offices of Indian Agents, Jno. F. Smith, Kamloops, Peter Bryne, New Westminster, and Wm. McAllan, Ft. Fraser, A. M. Tyson, Insp. of Indian Agencies, Vancouver, W. E. Ditchburn, Victoria, and P.O. at Ashcroft, Quesnal and Ft. George, Dom. Govt. Dept. of Indian Affairs, Assistant Deputy and Secretary, J. D. McLean, Ottawa.

Fredericton, N.B.
Majestic Picture Theatre, [illegible] [illegible] and Carleton streets, planned for David M. Richards. Work to start as soon as possible. Ventilating system to be installed. Seating required.

Guelph, Ont.
Alterations and additions to College, contemplated for Jesuit Fathers, Father Doyle. Building has been purchased, 1 storey will be added and entire building remodelled for college. Plans will be prepared.

Hamilton, Ont.
Sunday School, cost $30,000, Rebecca street, planned for Trustees of Wesley Methodist Church. Pastor, Rev. E. A. Pearson, 137 Catharine St. N. Architects, Stewart & Witton, 7 Hughson St. S. Stone foundation, brick construction, maple floors.

Hochelega
Enlargement of school, cost $80,000, Strathcona, for R. C. School Commissioners, 140 Davidson street. Architects, Viau & Venne, 76 St. Gabriel street, Montreal. Tenders received by General Contractors, Durocher & Fortin, 29 Chambly. Cement foundation, structural steel and solid brick construction.

London, Ont.
Temple, cost $20,000, contemplated by Woodmen of the World. Address, Clair Jarvis, 314 Grosvenor street. Committee named to select site. Plans to be prepared shortly.

Middleton, N.S.
Public building. Owner, Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders will be called in the near future.

Montreal, Que.
Post office, at Maisonneuve, contemplated by the Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders will be called shortly.

Postal station "F," contemplated by the Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders will be called shortly.

Ottawa, Ont.
Church, cost $60,000, Percy and 4th ave., contemplated for Glebe Catholic Congregation, per Father Whelan, Nepean street. Rev. Father O'Gorman is in charge of new parish. Plans and specifications will be drawn.

Additions to church, cost $14,000, planned for Fourth Ave. Baptist Congregation. Pastor, Rev. Mr. Duncan. Funds are at present being raised for the above additions.

Customs building, MacKenzie avenue. Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Time extended for receiving tenders from March 31st to April 15th.

Portage la Prairie, Man.
St. Cuthberts R. C. congregation will erect new church and probably school and convent as well. Rev. J. W. Arsenault.

South Vancouver, B.C.
Alterations and additions to Municipal Hall, cost [illegible], planned by Council. Reeve, Kerr. Committee has been appointed to report on the matter.

St. John, N.B.
Infirmary, Cobourg, for Catholic Diocese (Sister of Charity). Bishop, Le Blanc, Waterloo street. Tenders received by Architect, F. Neil Brodie, 42 Princess street. Plans and specifications at his office.

Toronto, Ont.
[illegible] addition, [illegible] [illegible] [illegible]valles, for Suburban Amusement Company, [illegible] Victoria street. Architect, [illegible] H. Finney, [illegible] [illegible] [illegible].

storeys, [illegible] x [illegible], brick foundation, structural steel and brick construction. Plans drawn.

Public lavatory and stores, Dundas street. Tenders will be received by Mayor H. C. Hocken, chairman Board of Control, up to noon, April 15, for masonry, carpentry, plumbing, heating, electric wiring, etc., roofing, plastering, painting. Plans, specifications, etc., at office of City Architect, City Hall, Toronto.

Tenders will be received by Secretary-Treasurer, W. C. Wilkinson, City Hall, Board of Education, until noon April 11th for the several trades required in the erection of new building at Carlton school, Davenport road and Osler Ave.

Club house, at Island, planned by Toronto Rowing Club. Secretary E. T. Boland, 78 King street east. Negotiations are now on for site with Parks and Exhibition Committee.

Addition to Balmy Beach school, cost $12,000, recommended by Property Committee. Architect, F. E. Belfry, is preparing plans. Brick construction. Board of Education. Secretary-Treasurer, W. C. Wilkinson.

Vancouver, B.C.

School and club building, cost $70,000, Haro street, for the Congregation of the Holy Rosary Church. Three storeys, 66 x 132, concrete foundation, brick and structural steel construction building, will include lunch rooms, assembly hall, dining room, kitchen, etc. Tenders received by Architects, Tegan & Vezina, 837 Hastings west.

Winnipeg, Man.

Additions planned by St. Boniface Hospital Board, Tache Avenue. Architect, J. A. Hudon, 608 Builders' Exchange Bldg., has been commissioned to prepare plans.

Plans have been- prepared and approved for alterations to the Signal Service Building on Rupert avenue, to accommodate Police Dept.'s prisoners. Cost $3,200. Secretary Police Commission, A. A. Aird, Rupert avenue.

CONTRACTS AWARDED

Duncans, B.C.

School, cost $30,000. Secretary, Jas. Greig. Architect, W. T. Whiteway, 543 Hastings west, Vancouver. The Island Building Company, general contractors, are receiving sub-tenders now. Two storey, brick construction.

Edmonton, Alta.

Hotel, cost $400,000, 2nd street, for Empire Hotel Co., Ltd. Architect, James Henderson, F.R.I.B.A. General contractors, James Prentice Construction Co. Four storeys and basement, 150 x 150, plate glass.

Warehouse, cost $9,700, 1064 Dundas street. Owner and builder, R. Laidlaw & Son, Traders Bank. Three storeys, 20 x 80, cement foundation, brick construction.

Granby, Que.

Alterations to church, cost $9,000. Catholic Church Congregation. General Contractors, Barre & Charron, Court & Franklin. Spruce floors, woodwork repair, re-arrangement of seating, etc., plumbing.

London, Ont.

Court House, cost $35,383, repairs, for County of Middlesex. Architects, H. C. McBride, Edge Block. Masonry, Coup Bros., $678. Carpentry, H. R. K. Tozer, 12 Woodward, $10,984. Plumbing, Noble & Rich, 237 Queen's Ave., $6,187. Painting and glazing, Fitzgerald & Corpe, 585 Princess ave., $2,600. Iron stairway, Dennis Wire & Iron Works Co., 22-26 Dundas street, $3,000. Plastering, H. Stratford, 530 English, $7,075. Tile work, The Lautz Co., 145 Church street, Toronto, $2,564. Vault fittings, Office Specialty Co., 97 Wellington street W., Toronto, $2,295. Electric wiring and office fittings not yet awarded.

Ottawa, Ont.

Hall, cost $10,000, for Episcopal Corp. of Ottawa. Architect, Foreign. General contractors, Rockburrie & Singi, 12 Elm. Two storeys, 48 x 66, brick veneer construction, cement foundation. Foundations started.

Prince Albert, Sask.

Palace, cost $20,000, for Bishop Newnham. Architects, Creighton & Crowther, K. C. Bldg. General contractors, A. E. Cragg & Co., Box 1133. Two storeys, 50 x 50, cement foundation, brick and cement construction.

Toronto, Ont.

Addition to Riverdale school, cost $51,540. Architect, F. E. Belfrey. Carpenter, W. Williamson, Queen and Woodbine, Roofing, J. Flowers, 5 Denison avenue. Painting, J. Phinnemore, 455 Yonge. Plumbing, L. Legrow, 92 Harbord. Plastering, Beaver & Co., 62 Winchester street. Ornamental iron, Can. Orn. Iron Co., 88 River street. Heating, electric and ventilation, F. Armstrong, 277 Queen west. Addition consists of gymnasium room for domestic science, manual training and 2 class rooms. W. C. Wilkinson, Secretary Board of Education.

Pasturizing building, cost $6,000, College, for Hospital for Sick Children. Architects, Stevens & Lee, 23 Scott St. General contractors, R. Robertson & Sons, Confed. Life Building. Three storeys, 32 x 49, brick foundation, structural steel and brick construction.

Winnipeg, Man.

Addition to laundry for C. P. R. Laundry Co., Granville street. General contractor, J. F. Hunter. Plans drawn by J. F. Hunter, c/o owner.

Business Buildings and Industrial Plants

Calgary, Alta.

Warehouse for the Sherwin-Williams Paint Co., 897 Centre street, Montreal. To be erected at corner of 11th ave. and 7th street west. Plans being considered.

Duncans, B.C.

Canadian Bank of Commerce has purchased lot 65 x 50 at corner of Station and Craig streets and will erect two-sty. brick building.

Edmonton, Alta.

Store and warehouse, cost $85,000, Jasper ave., for Western Construction Co. Architect, James Henderson, F.R.I.B.A. Five storeys and basement, 55 x 150, cement foundation, stone and brick construction. Plans drawn.

Hotel, cost $200,000, for G. W. Chambers. Architects, Van Siclen & Macomber, 314-15 Alexandra Bldg. Brick and reinforced concrete construction, terra cotta faced. Bedford stone, marble, architectural terra cotta. Work so far has been done by day labor, but tenders for remainder called April 8th. Received by architect. Foundations in.

Creamery, First street and Thompson ave., planned by the Alberta Central Creamery Co., 40 x 80, who have applied to city for water. Work will start as soon as ground is ready. To be completed by March 29, 1914.

Store and apartments, cost $145,000, 7th street, for Chas. Carey, c/o Corona Hotel. Eight storeys, 100 x 160, concrete foundation, brick, structural steel and reinforced concrete construction. Plans prepared.

Guelph, Ont.

Sash and door factory contemplated by R. Laidlaw Lumber Co., Traders Bank Bldg., Toronto. Site has been purchased and plans will be prepared.

Hamilton, Ont.

Warehouse, cost $40,000, Caroline N. for Hamilton Importing Co., King William street. Architects, Watt & Blackwell, Lister Chambers. Five storeys, 200 x 50. Plans in progress.

Addition and alterations to factory, cost $14,000, for Firth Bros., 106 James street north (clothier). General contractors, J. Poag & Co., Westinghouse ave. Glass, Hamilton Store Front Co. Three storeys, structural steel and brick construction.

Humboldt, Sask.

Flour mill, cost $30,000, contemplated. Owner, Hon. A. P. Macnab, Regina, Sask. Frame construction, electric lighting. Plans in progress.

London, Ont.

Workshop and store, cost $20,000, planned by City Council, Water Commissioners. Chairman of Commissioners, Philip Pocock, c/o London Shoe Co. Two storeys, 90 x 30 and 70 x 40, cement foundation, reinforced concrete, structural steel construction, concrete floors.

Montreal, Que.

Store and flat, cost $4,000. Owner and builder, Ulric Langon, 12 Emery street. Two storeys, 40 x 77, frame and brick construction.

Warehouse, cost $3,500, St. Andre, for H. Saboarin & Co., 2543 St. Hubert St. Builder, L. Naud, 103 Dorion. Three storeys, 25 x 80, 3-in. plank, frame and brick construction, concrete foundation, felt and gravel roofing.

Public market, cost $100,000, Ontario street. Architect, Marius Dufresne, Lasalle and Ontario streets. Work is being done by day labor. Granite supplied by J. G. Piche, 145 Bleury, $3,999. Roofing, heating and plumbing, Theo. Lessard, 191 Craig street, $57,380. 2½ stys., 100 x 100, cement foundation, granite, stone and pressed brick construction.

Store and flats, cost $4,500, Notre Dame west, St. Henri. Owner and builder, N. Mainville, 2237 Notre Dame west. Three storeys, 23 x 55, concrete foundation, 3-in. plank, frame and brick construction.

Garage and store, cost $15,000, St. Catherine street west, for R. A. Girard, 1253 St. Laurent Blvd. Tenders received by architect, Jos. Art Godin, 269 St. Denis street. Three storeys, 52 x 52, concrete foundation, solid brick construction.

Storage shed, cost $12,000, for Consumers Cordage, 283 St. Patrick street. Architects, Ross & MacDonald, 1 Belmont. Two storeys, 72 x 88, concrete foundation, brick construction. Plans drawn.

New Westminster, B.C.

Stores and apartments, cost $50,000, Carnarvan and 10th streets, for Lee Din, care architect, J. F. Watson, New Westminster Trust Bldg., New Westminster. Three storeys, 66 x 132. Plans prepared.

Stores and apartments, cost $50,000, 8th street, for Law A. Soong & Lee Sing, care architect, J. F. Watson, New Westminster Trust Bldg., New Westminster. Two storeys. To be erected on 8th street between Carnarvan and Blackie. Plans prepared.

Ottawa, Ont.

Business block, Bank street, for F. W. Carling, Metropolitan Bldg. Ten stys., 66 x 80, structural steel construction. Plans in progress.

Grain mill planned for R. C. Cummings, Cummings' bridge. Existing mill destroyed by floods.

Addition to factory for Dominion Bridge Co., per W. A. Mattice, Eastview. Fireproof construction. Plans will be prepared.

Saskatoon, Sask.

Theatre, cost $150,000, planned by a syndicate. Charles Angle, proprietor Empress Theatre, interested. Seating capacity 1,500.

South Edmonton, Alta.

Store and apartments, cost $4,000, 4th ave. south. Architect and general contractor, Walter T. Dixon, General Del. Two storeys, 24 x 33, concrete foundation, frame construction.

Stratford, Ont.

Clothing factory contemplated for the Queen Tailoring Co., 39 William street. Address Mr. Queen, care company. Architect to be selected. Three storeys, white brick construction, electric lighting, plumbing.

Strathroy, Ont.

Repairs and additions to factory, cost $15,000, planned for Colonial Furniture Co., Cainan street. Upper storey with all workroom equipment was blown completely away and ruined. New storey will be added, repairs made and new equipment secured as soon as possible.

Toronto, Ont.

Theatre, cost $8,000. Owner and builder, H. Butler, 1528 Danforth. One sty., 40 x 100, cement foundation, structural steel and brick construction.

Warehouse alterations, cost $5,000, for Maclean Products Co., 74 Front E. Architect, Leonard Foulds, King & Leader Lane. Three storeys, brick foundation, structural steel and brick construction. Plans drawn.

Factory addition, cost $15,000, for Fox & Co., Charlotte & King. Architect, H. G. Paull, 395 College street. 3-storeys, 74 x 88, brick and cement foundation, structural steel, reinforced concrete and brick construction. Plans drawn.

Vancouver, B.C.

Office building, Pender street, for Law A. Soong. Architect, J. F. Watson, Westmintser Trust Bldg., New Westminster. Six storeys, reinforced concrete construction. Plans in progress.

Victoria, B.C.

Office building, cost $175,000, Government and Coromorant, for R. T. Elliott, K.C. Architect, Jesse M. Warren, 503 Central Bldg. Eight storeys, reinforced concrete construction, pressed brick and terra cotta exterior, steam heating, 2 high speed elevators. Plans prepared.

Welland, Ont.

Hotel. Owner and builder, Harry Jones, Dainville. Three storeys.

Windsor, Ont.

Bank, store and flats, cost $10,000, Wyandotte, for A. J. Chapleau. Architect, G. Jacques & Co., Boug Bldg. Two storeys, 50 x 60, cement foundation, pressed brick front. Plans being considered.

Theatre and flats, cost $11,000, Wyandotte, for M. D. Armaly, Windsor. Architect, G. Jacques & Co., Boug Bldg. Plans in progress.

Winnipeg, Man.

Alterations to store, cost $9,700, Main street, for D. R. Dingwall Ltd., Portage and Main street. Plans ready.

Addition to restaurant, cost $9,000, for Lama & Lombards, 391 Portage avenue. Plans ready, permit issued.

Storage warehouse and garage, cost $65,000, Gomez street, for Gaults Ltd., Bannatyne and King street. Architect, D. W. Bellhouse, 703 Canada Bldg. Four storeys and basement, 59 x 111, garage 30 x 60. Tenders have not been considered and project will not go on for two months. New tenders may be called.

Sash and door factory for Nelson & Foster, 1398 Erin street. Plans are being prepared.

CONTRACTS AWARDED

Calgary, Alta.

Brass foundry, cost $80,000, for the Robertson Western Brass Co. General contractors, Westinghouse, Church, Kerr & Co. Excavating done.

Stores and rooms, cost $10,000, 14th street west and 27th ave. Owner and general contractor C. T. Summers. Architects, Dowler & Stevenson, Alexander Corner. Two storeys, 50 x 45, cement foundation, brick construction. Excavating done.

Edmonton, Alta.

Factory, cost $7,000, Naymo. Owner and general contractor, J. A. Burgess, 1001 Namayo ave. Architect, Mr. Simpson, Namayo ave. Three storeys, 30 x 80, concrete foundation, frame construction, steel girders, felt and gravel rfg.

Stores and rooms, cost $7,000, Kinistino. Architect and general contractor, M. Sudyk, 448 Government street, Edmonton. Two storeys, [illegible] and cement foundation, brick veneer construction, walls done. Excavation started.

Hotel, cost $300,000, 410 rooms, 2nd and Jasper, planned by a syndicate. President, Geo. Brown, Alexandra Block. Architect, [illegible] Henderson, [illegible] Jasper ave. west. General contractor, Jas. Prentice, Edmonton. [illegible] concrete foundation, structural steel construction.

Ottawa, Ont.

[illegible]

street. General contractors and owners, Cowie & Moore, 302 First ave. Painting, G. T. Green, 776 Bank street.

Store and warehouse, cost $15,000, for Kalib Fanab, York street. Architect, W. E. Noffke, Central Chambers, Elgin St. General contractor, Jno. Alexander, 10 Turgeon. Three storeys, cement foundation, solid brick construction. Excavation started.

Vancouver, B.C.

Warehouse and office, cost $100,000, Yukon and Front streets, for B. C. Telephone Co., 555 Seymour street. General contractors, Smith & Buckland, New Westminster. Excavation done.

Windsor, Ont.

Bank, cost $4,000, Ouellette, for Dr. J. S. Labelle, London and Ouellette Sts. Architects, G. Jacques & Co., Boug Bldg. General contractors, Canadian Store & School Furniture Co., Preston Ont. Alterations to new business block for Provincial Bank of Canada. Bank and office fixtures, grill work, vaults, safes.

Residences

Charlottetown, P.E.I.

Residence, cost $5,000. Owner and Architect, Alex Horne. Two storeys, 40 x 32, cement foundation, wood construction. Tenders called.

Dundas, Ont.

Two residences, cost $6,000, Park St. Owner and builder, Jno. Dickson, Dundas, Ont. 1½ storey, cement foundation, cement construction. Plans drawn.

Hamilton, Ont.

Twenty residences, cost $40,000, West end. Owner and builder, William Theaker, 447 Garth street south. Brick construction. Plans being considered.

Two residences, cost $4,800, east end. Builder and owner, William Kinch, 54 Frederick ave. Stone foundation, brick construction. Plans ready.

London, Ont.

Residence, cost $7,000, for John White, 180 Maitland. Architects, McBride & Fairfield, Dundas and Richmond streets. $2\frac{1}{2}$ storeys, 40 x 75, brick foundation, red brick construction. Plans drawn.

Montreal, Que.

Residence, Woodlands, for J. S. Ross, 393 Kensington ave. Architects, Marchand & Haskel, 164 St. James. Subtenders received by general contractor, Jos. Denis, Belgrave ave., Notre Dame de Grace. Concrete foundation, cut stone and brick construction.

Residence, Redpath, for H. W. Beauclerk, 710 Transportation Bldg. Tenders received by architects, Hutchison, Wood & Miller. [illegible] foundation, cut stone, terra cotta, structural steel and pressed brick construction.

New Westminster, B.C.

Apartments, cost $20,000, 8th and Carnarvon, for Law A. Soong, care architect, J. F. Watson, Westminster Trust Bldg., New Westminster. [illegible] Plans being prepared.

Ottawa, Ont.

[illegible] W. Mahon. Stone foundation, brick veneer construction. Plans in progress.

Residence, cost $5,000, McKellar Town[illegible]

Tenders and For Sale Department

Tenders for Power House Equipment

[illegible] tenders, registered and clearly marked [illegible] "Tender for Power House Equipment," and addressed to the City [illegible] at Regina, Sask., will be received [illegible] April 30th for the supply of:

1 [illegible] synchronous motor generator or motor converter set, complete with panel for the control of A.C. motor and generator panel, and equalizing pedestal for the control of D.C. generator.

Specifications may be had upon application to Mr. E. W. Bull, Superintendent of Light and Power, Regina, Sask.

A marked cheque for five (5 p.c.) per cent. of the amount of bid must accompany each tender.

The City Commissioners reserve the right to reject any or all tenders.

E. W. BULL,
11 15 Superintendent of Light and Power.

TENDERS

Tenders addressed to the undersigned at Ottawa and marked on the envelope "Tender for Mixed Paints," will be received up to noon of the **21st day of April, 1913**, for supplying mixed paints manufactured and put up in accordance with the specification prepared by the Department of Marine and Fisheries to the satisfaction of the Inspector of the Department.

Tenderers will quote for the different lines of paints delivered at the following places, put up in one and half gallon cans, viz.:—Charlottetown, P.E.I., St. John, N.B., Halifax, N.S., Quebec, P.Q., Montreal, P.Q., Prescott, Ont., Parry Sound, Ont., and Victoria, B.C.

The approximate quantities required are as [illegible]

Lighthouse white	5,000	gallons.
Roof red	2,600	"
Buoy black	1,600	"
[illegible]	1,800	"

All quotations must be for Imperial gallons delivered free on board cars at destination.

Tenderers may quote for paint delivered at one or all the places mentioned but the Department reserves the right to accept the whole or any part of the tender.

Specifications can be seen at the Agencies of this Department at Charlottetown, P.E.I., Halifax, N.S., St. John, N.B., Quebec, P.Q., Montreal, P.Q., and Victoria, B.C.

Specifications can be procured upon application from the Department of Marine and Fisheries at Ottawa and from the Agent of that Department in Victoria, B.C.

Each tender must be accompanied by an accepted cheque on a chartered Canadian bank for the sum of $500, which cheque will be forfeited if the successful tenderer decline to enter into a contract prepared by the Department or fails to deliver the paint ordered in accordance with the specification.

Newspapers copying this advertisement without authority from the Department will not be [illegible]

ALEX. JOHNSTON,
Deputy Minister of Marine and Fisheries.
Department of Marine and Fisheries,
—38500. Ottawa, March 12th, 1913. 14-15

City of Port Arthur

NOTICE

Sealed tenders, endorsed on the envelope "Tenders for Sewer and Waterworks Material," will be received by the undersigned up to 5 o'clock p.m. of **Monday, April 14th, 1913**, for the supply and delivery of a quantity of material for Sewer and Waterworks Department, delivered at City Store House, Port Arthur, via boat and rail, list of material required may be obtained from the undersigned, or Contract Record and Engineering Review, Toronto, Ont.

A marked cheque for 10 per cent. of the estimated amount of the contract must accompany each tender.

The lowest or any tender not necessarily accepted.

J. J. HACKNEY,
Commissioner Utilities.
Corporation Offices, Port Arthur,
March 5th, 1913. 14-15

Department of Railways and Canals, Canada

TRENT CANAL

Notice to Contractors

FENELON FALLS DAM

Sealed tenders, addressed to the undersigned and marked "Tender for the Fenelon Falls Dam, Trent Canal," will be received at this office until 16 o'clock on **Thursday, May 1st, 1913**.

Plans, specifications and form of contract to be entered into can be seen on or after April 3rd, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind, that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $1,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 4th April, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—39430. 15-16

CITY OF FORT WILLIAM

Tenders For

Water Mains, etc.

Alternative bids are invited for cast iron and steel pipes and specials for 18-inch water main.

Sealed tenders, addressed to the City Clerk, endorsed "Tender for Water Main," will be received up to 5 o'clock p.m. of **Thursday, April 17th, 1913.**

Forms of tender can be obtained from the undersigned upon application.

The lowest or any tender not necessarily accepted.

RAY R. KNIGHT,
City Engineer.
March 26, 1913. 14-15

Department of Railways and Canals, Canada

Hudson Bay Railway

Notice to Steam Tug Builders

Sealed tenders addressed to the undersigned and endorsed "Tender for Steel Tug Boat," will be received at this office until 16 o'clock on **Wednesday, April 16th, 1913**, for one Steel Tug Boat to be delivered at one of the following ports, viz:—Quebec, Montreal, St. John, Halifax, or Sydney, not later than the 1st of September, 1913.

Plans and specifications can be seen on or after this date, and full information obtained at the following places:—

At the office of Chief Engineer, Department of Railways and Canals, Ottawa.

At the office of Supt. Engr. Quebec Canals, New Birks Building, Montreal.

At the office of Intercolonial Railway Agent, 7 Du Fort Street, Quebec.

At the office of Intercolonial Railway Agent, 107 Hollis street, Halifax.

At the office of Intercolonial Railway, Ticket Office, St. John, N.B.

At the office of W. M. Everall, Resident Inspecting Engineer, Port Arthur.

At the office of Intercolonial Railway Agent, 51 King street east, Toronto.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of $3,500 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, April 2nd, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—39228. 15

TENDERS

To Contractors

Bulk or separate tenders will be received by the undersigned up to Wednesday, the 16th day of April, at 5 o'clock p.m., for the several trades required in the erection of a

Warehouse Building

on the southeast corner of Adelaide and Charlotte streets, Toronto.

Plans and specifications may be seen and all other information obtained at the offices of the architect.

The lowest or any tender not necessarily accepted.

GEO. W. GOUINLOCK, Architect,
Suite 1108 Temple Building,
15 Toronto, Ont.

TOWN OF SIMCOE

Province of Ontario

Sewerage Works

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on **Wednesday, April 23, 1913**, for the following works:—

Contract A.—Laying Main Sewer and Sewage Force Main.
Contract D.—Furnishing Cast Iron Pipes.
Contract G.—Sewage Pumping Machinery.
Contract P.—Sewage Pumping Station.
Contract S.—Tile Sewer Pipes.
Contract X.—Sewage Disposal Works.

Plans and specifications may be seen at the office of the Engineers, Toronto, or at the Town Hall, Simcoe, Ont.

No tenders necessarily accepted.

L. C. GIBSON, Esq., Mayor,
W. C. McCALL, Town Clerk,
15-16 CHIPMAN & POWER, Engineers

Separate sealed tenders addressed to the undersigned will be received until 4 p.m., on **Monday, April 28, 1913**, for the supply of hardware, brushes, manilla rope, packing, paint and paint oil, hose, wire rope, oils and greases, steam pipe and steam fittings, and chain for the departmental dredging plant in Ontario and Quebec.

Each tender must be sent in a separate envelope and endorsed "Tender for Hardware, Ontario and Quebec," "Tender for brushes, Ontario and Quebec," etc., as the case may be.

Tenders will not be considered unless made upon forms furnished by Department, and in accordance with conditions contained therein.

Combined specification and form of tender can be obtained at this Department and at the offices of J. L. Michaud, Esq., District Engineer, Merchants Bank Building, Montreal, P.Q., and J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, for the amount mentioned in the tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
37612 Ottawa, April 5, 1913.
15-16

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Bracebridge, Ont.," will be received at this office until 4 p.m. on **Monday, April 28, 1913**, for the work mentioned.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station F. Yonge street, Toronto, at the Post Office, Bracebridge, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—36823. 15-16

City of Saskatoon

Material and Labor re Sewer and Water Extensions 1913

Sealed tenders, addressed to the City Commissioners and endorsed as per contents of each contract, will be received until 12 o'clock noon, **Tuesday, April 15th, 1913.**

Instructions to bidders, specifications and form of tender can be had on application to George T. Clark, City Engineer.

A deposit of $30 will be required for plans and specifications for labor on sewer and water extensions.

Contract No. 132.
Furnishing and delivery:—
130 Gate Valves, ranging in size from 6 in. to 24 in.

Contract No. 133.
Furnishing and delivery:—
75 Fire Hydrants.

Contract No. 134.
Furnishing and delivery:—
250 Manhole Frames and Covers.
51 Catch Basin Frames and Covers.

Contract No. 135.
Labor on Sewer and Water Extensions.
The Corporation reserves the right to let this contract in five sections. The approximate quan[illegible]ter mains, and all the necessary manholes, valves and hydrants.

Contract No. 136
[illegible] specials, ranging in sizes from 4 to 24 in.

Contract No. 137.
[illegible]cials, ranging in sizes from 5 in. to 24 in.

F. E. HARRISON, Mayor,
Chairman of Commissioners,
Saskatoon, March 13, 1913. [illegible]

Thorold Public School

Bulk or separate tenders will be received by the undersigned for all trades required in the erection and completion of a new Public School Building to be erected in the Town of Thorold, Ont., until 5 p.m., **Monday, April 21st, 1913.**

Plans and specifications may be seen at the office of the Architect, 46 Queen Street, St. Catharines, Ont., Public Library Building, Thorold, Ont., and at the office of the Contract Record and Engineering Review, Toronto, Ont.

The lowest or any tender not necessarily [illegible]

A. E. NICHOLSON, Architect,
46 Queen Street,
15-16 St. Catharines, Ont.

NOTICE

Extension of Time

CITY OF VERNON, B. C.

Tenders for 500 B.H.P. Diesel Engine and 375 kw. Generator

The time for the receipt of tenders for the following equipment has been extended to 3 p.m., **April 18th, 1913.**

Supply and installation of one 500 B.H.P. Diesel Engine.

Supply and installation of one 375 kw. 2300 volt, three phase, sixty cycle generator, with direct connected exciter.

Supply of one ten-ton travelling crane.

Specifications may be seen at the City Hall, Vernon, B.C., the offices of the Electrical News, and Canadian Engineer, Toronto; the Contract Record, Winnipeg; and the Consulting Engineers, Vancouver.

Tenders to be addressed to D. G. Tate, City Clerk, Vernon, B.C.

MATHER, YUILL & COMPANY, LTD.,
Consulting Engineers,
15 Vancouver, B.C.

City of Moose Jaw, Sask.

TENDERS FOR

Valves and Hydrants

Sealed tenders, marked "Tenders for Valves and Hydrants," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following, F.O.B. cars Moose Jaw:—

[illegible] 2½ in. hose connections and one 3 in. steamer connection. All connections to have seven threads to the inch. Frost cases must be provided and have a depth of 8 ft. 2 in. The top of the main valve stem shall fit a 1½ in. triangular key and turn to the left to open.
[illegible] 6 in. gate valves and spindles.
50 8 in. gate valves and spindles.
10 [illegible]
35 12 in. gate valves and spindles.

Tenderers must submit detailed drawings and specifications of the hydrants and valves they propose to supply. No tender will be considered if this is omitted. Time of delivery must also be stated.

[illegible] tender.

[illegible] accepted.

[illegible]
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.

Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

[illegible] Departmental [illegible] Monday, April 21, 1913 [illegible] tender.

[illegible] tender can be obtained at this Department and at the offices [illegible] Merchants Bank Bldg., Montreal, P.Q., and J. G. Sing, Esq., District Engineer, Confederation Life [illegible]

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public [illegible] on tender form, which will be forfeited if the persons tendering decline to enter into a contract when called upon to do so, or fail to complete the contract. If the tender be not accepted, the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

[illegible]

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, April 3, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—37722. 15-16

Notice to Contractors

TENDERS FOR SEWERS

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, April 15th, 1913**, for the construction of the following sewers:—

West Toronto Division No. 1, Bloor Street;
West Toronto Division No. 1, Clendennan Ave.;
West Toronto and Earlscourt Outlet;
McLean Ave., Queen St. to Lake Front;
Lane first south of Bloor St., Huron St. to 254 feet east;
Lane first east of Sunnyside Ave., Geoffrey St. to Grenadier Road;
Lane first north of Yonge St., Bloor St. to south end, thence west to Yonge Street;
Lane first west of Spadina Ave., College St. to Robert Street;
Lane first south of Dundas St., Medland to Pacific;
Waverley Road, Queen St. to 1300 ft. north;
Mountjoy Ave., Greenwoods Ave. to 340 ft. east;
Mountnoll Ave., Greenwoods Ave. to 330 ft. east;
Mountalen Ave., Greenwoods Ave. to 340 ft. east;
Felstead Ave., Greenwoods Ave. to 340 ft. east.

Specifications and tender forms may be obtained upon application at the office of the Sewer Branch, Department of Works, City Hall, [illegible]

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with or the tenders will be declared informal.

Tenderers shall submit with their tenders the names of two personal sureties approved of by the City Treasurer, or in lieu thereof, the bond of a guarantee company, approved of as aforesaid.

The lowest or any tender not necessarily [illegible]

H. C. HOCKEN, Mayor,
Chairman, Board of Control.

City Hall, Toronto,
April 3rd, 1913. 15

TENDERS
FOR
36″ Cast Iron Pipe

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on **Tuesday, April 15th, 1913**, for 36-in. Cast Iron Pipe.

Specification and tender form for the foregoing may be obtained upon application at the office of the Waterworks Section, Department of Works, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents. The usual conditions relating to tendering, as prescribed by city by-law, must be strictly complied with, or the tenders may be declared informal. Tenderers shall submit with their tenders the name of two personal securities, approved by the City Treasurer, or in lieu thereof, the bond of a guarantee company, approved as aforesaid.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.

City Hall, Toronto, April 1st, 1913. 15

City of Moose Jaw, Sask.

TENDERS
FOR
Cast Iron Pipe and Specials

Sealed tenders, marked "Tenders for Tile Pipe and Specials," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon, on **Wednesday, April 30th, 1913**, for the supply and delivery of the following, f.o.b. cars, Moose Jaw:—

1500	ft.	20-in. pipe.
2000	ft.	18-in. pipe.
2800	ft.	15-in. pipe.
900	ft.	12-in. pipe.
8000	ft.	10-in. pipe.
23000	ft.	8-in. pipe.
40000	ft.	6-in. pipe.
1200	ft.	4-in. pipe.
26		6 in. off 20-in. Tees
90		6-in. off 18-in. Tees
50		6-in. off 15-in. Tees
15		6-in. off 15-in. Y's
20		6-in. off 12-in. Tees
10		6-in. off 12-in. Y's
350		6-in. off 10-in. Tees
200		6-in. off 10-in. Y's
500		6-in. off 8-in. Tees
400		6-in. off 8-in. Y's
6		4-in. off 18-in. Tees
5		4-in. off 15-in. Tees
15		4-in. off 10-in. Tees
45		4-in. off 8-in. Tees
125		4-in. Elbows
12		pieces 20-in. channel pipe
6		pieces 18-in. channel pipe
20		pieces 15-in. channel pipe
8		pieces 12-in. channel pipe
40		pieces 10-in. channel pipe
85		pieces 8-in. channel pipe
850		4-in. to 6-in. increasers.
800		6 in. 1/8 Bends.

All pipes and specials must be first class glazed tile. All pipe and specials over 12-in. to be of double strength. Tenderers must state time of delivery. Each tender must be accompanied by a marked cheque in favor of the Corporation of Moose Jaw for five per cent. of the total amount of the tender. The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
C **1515 Rockefeller Bldg., Cleveland, O.**

TOWN OF WATROUS
Province of Saskatchewan

Appointment of Town Engineer

Applications are invited for the position of Town Engineer to supervise the construction of Waterworks Distributing System, Sewerage Disposal System and Concrete Sidewalks.

Applicants should state experience and salary required.

Applications should be addressed to the undersigned to be received not later than April 21st, 1913.

F. C. WRIGHT,
15-16 Secretary-Treasurer.

City of Moose Jaw, Sask.

TENDERS
FOR
Tile Pipe and Specials

Sealed tenders, marked "Tenders for Cast Iron Pipe and Specials," addressed to the City Commissioners, Moose Jaw, will be received up till twelve o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following material, F.O.B. cars, Moose Jaw:—

120	ft.	20-in. pipe
6000	ft.	12-in. pipe
1100	ft.	10-in. pipe
8620	ft.	8-in. pipe
23000	ft.	6-in. pipe
3000	ft.	4-in. pipe
40		6-in. off 6-in. Tees
32		6-in. off 8-in. Tees
7		6-in. off 10-in. Tees
10		6-in. off 12-in. Tees
2		12-in. off 12-in. Tees
6		8-in. off 12-in. Tees
6		6-in. x 6 x 6 x 6 crosses
6		6 x 6 x 8 x 8 crosses
2		6-in. x 6-in. x 10-in. x 10-in. crosses
5		6-in. x 6-in. x 12-in. x 12-in. crosses
2		10-in. x 10-in. x 12-in. x 12-in. crosses
1		10-in. to 12-in. increaser
150		6-in. offsetts
60		8-in. offsetts
10		10-in. offsetts
60		12-in. offsetts
50		6-in. plugs
25		6-in. caps
25		8-in. plugs
15		8-in. caps
10		10-in. plugs
10		10-in. caps
10		12-in. plugs
10		12-in. caps
6		6-in. 1/4 bends
6		6-in. 1/8 bends
6		8-in. 1/4 bends
6		8-in. 1/8 bends
5		10-in. 1/4 bends
5		10-in. 1/8 bends
5		12-in. 1/4 bends
5		12-in. 1/8 bends

All pipes to be class "C" and all specials to be class "D." All pipes and specials must conform to the standard specifications of the Canadian Society of Civil Engineers. Tenderers must state time of delivery, and each tender must be accompanied by a marked cheque in favor of the Corporation of the City of Moose Jaw for 5 per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

CITY OF LONDON, ONT.

Sealed tenders will be received up to noon, **May 1st, 1913**, by the Board of Water Commissioners, City of London, Ontario, Canada, for:

1450 tons of 4-inch, 6-inch, 8-inch, 10-inch and 12-inch cast iron pipe. Also for 94 valves and 20 tons of special castings for the above.

75,000 lbs. pig lead.

64,000 lbs. lead pipe, and

3,000 lbs. Russian jointing hemp.

For specifications and form of tenders, address H. J. Gaubitz, General Manager, Board of Water Commissioners, London, Ont. 14-15

Tenders Wanted

Public School Board Edmonton

Sealed tenders will be received by the undersigned up to **Thursday, April 17th, 1913**, for the erection of a seventeen class room brick school in Westmount Subdivision, Edmonton, Alta.

Tenders must be accompanied by a certified cheque for five per cent. of tender.

Plans and specifications may be obtained at the Public School Board, Edmonton.

The lowest or any tender not necessarily accepted.

Edmonton Public School Board,
14-15 Edmonton, Alta.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Acton, Ont.," will be received until 4 p.m., on **Wednesday, April 30, 1913**, for the construction of a Public Building at Acton, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained on application to the Postmaster at Acton, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station F., Yonge street, Toronto, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 29, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 34534 14-15

TENDERS

Sealed tenders addressed to the Secretary, Department of Indian Affairs, Ottawa, will be received up to noon, **Saturday, May 3, 1913**, for the construction of a steel highway bridge over Conger Creek in the Maniwaki Indian Reserve, County of Wright, Quebec.

Detailed information will be furnished on application to the said Secretary of the Department of Indian Affairs.

The lowest or any tender will not necessarily be accepted.

The unauthorized insertion of this advertisement in any newspaper will not be paid for.

J. D. McLEAN,
Asst. Deputy and Secretary.

Department of Indian Affairs.
38623. Ottawa, March 18, 1913 14-16

Special Notice

Every mon who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect. No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal 119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders for Dredging

[illegible] and endorsed "Tender for Dredging, Port Burwell, Ontario," will be received until 4 p.m., on **Tuesday, April 22, 1913**, for dredging required at Port Burwell, Ontario.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for.

Contractors must be ready to begin work immediately on the opening of navigation.

[illegible] the order of the Honorable the Minister of Public Works, for fifteen hundred dollars ($1,500), which will be forfeited if the person tendering de- [illegible] for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
[illegible]

[illegible]
Ottawa, March 29, 1913

[illegible] ment if they insert it without authority from the [illegible] 38872 14-16

CITY OF SASKATOON

TENDERS FOR

Double Tracking Street Railway

Sealed tenders, addressed to the City Commissioners, Saskatoon, and endorsed "Tender for Double Tracking Street Railway," will be received up to twelve o'clock noon on Thursday, **the 24th day of April, 1913**, for double tracking certain streets in the City of Saskatoon Municipal Street Railway.

Specifications, instructions to bidders, and tender forms can be obtained on application to Mr. E. Hanson, Superintendent of Street Railway, Saskatoon.

The lowest or any tender not necessarily [illegible]

F. E. HARRISON, Mayor,
Chairman of Commissioners.
[illegible] 1913. 15

CITY OF BERLIN

Tenders For

TRUNK SEWER

Sealed tenders addressed to A. H. Millar, City Clerk, and endorsed "Tender for Trunk Sewer," will be received up to 5 p.m., **April 17th, 1913**, [illegible]

1. The supply of approximately 11,913 lineal feet of 48-inch reinforced concrete sewer pipe.

2. The supply of approximately 3,265 lineal feet of 30-inch salt glazed vitrified sewer pipe and approximately 5,393 lineal feet of 18-inch salt glazed vitrified sewer pipe.

3. The laying of approximately 11,913 lineal feet of 48-inch concrete sewer and approximately 1,074 lineal feet of 30-inch sewer.

4. The laying of approximately 2,191 lineal feet of 30-inch sewer and approximately 5,393 lineal feet of 18-inch sewer pipe.

Plans and specifications may be seen at the office of Herbert Johnston, City Engineer.

The lowest or any tender not necessarily accepted.

HERBERT JOHNSTON,
15 City Engineer.

City of Moose Jaw, Sask.

TENDERS FOR

Manhole Frames and Covers.

Sealed tenders marked "Tenders for Manhole Frames and Covers," addressed to the City Commissioners, [illegible] twelve o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following material, F.O.B. cars Moose Jaw. Local tenderers must bid on the material delivered at the City Store Yards.

160 valve chamber frames and covers.
[illegible]

[illegible] tained on application to J. Antonisen, City Engineer, Moose Jaw.

Time of delivery must be stated.

Each tender must be accompanied by a marked [illegible]

[illegible]

L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
[illegible]

Department of Railways and Canals, Canada

Hudson Bay Railway

Notice to Tug Builders or Tug Owners

[illegible] undersigned [illegible] Tug," will [illegible] 16 o'clock on **Thursday, the 10th of April, 1913**, for a second-[illegible] following di-[illegible]

[illegible] 16 feet [illegible] 100 tons; [illegible]

Parties tendering will be required to submit specifications of the Tug it is proposed to supply together with the fullest information as to when and where built, etc., etc.

Tug to be ready for inspection and immediate delivery at one or other of the following ports, viz.:—Montreal, Quebec, St. John, Halifax or [illegible]

[illegible] tender not necessarily [illegible]

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, April 2nd, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—39227. 15

TENDERS

FOR

Equipment of Municipal Abattoir and Rendering Building proposed to be erected at the foot of Tecumseh Street, Toronto.

Bulk tenders for all equipment and general work on the above buildings, not included in builders' specifications (which will include machinery, pens, fences, motors, drives, elevators, conveyors, compressors, presses, evaporators, cooking tanks, bone and fat washers, boilers, pumps, plumbing, steam heating, painting, chimney, etc.), will be received by registered post only, addressed to the undersigned, up to noon on

Tuesday, 29th of April, 1913

[illegible] be seen and forms of tender and all information obtained at the office of Messrs. William R. Perrin & Company, Limited, 530 King street east, Toronto, and No. 200 Old Colony Building, corner Dearborn and Van Buren Streets, Chicago, Ill.

Envelopes containing tenders must be plainly marked on the outside, "Bulk Tender for Equipment of Municipal Abattoir and Rendering Building." The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with or tenders will not be entertained, and all tenders are to be subject to the condition that the work will be finished November 1st, 1913. Parties tendering shall submit with their tender the names of two personal sureties or the bond of a guarantee company.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
City Hall, Toronto,
April 1st, 1913. 15

Tenders for Debentures

Sealed tenders, addressed to the undersigned, will be received up to 5 p.m. on **Monday, the 14th day of March, 1913**, for the sale of **$11,-001.80**, Local Improvement Debentures of the Town of Petrolia, Ont., bearing interest at 5 per cent. and payable in 15 equal annual instalments of principal and interest.

The highest or any tender not necessarily accepted.

J. McHATTIE, Town Clerk.
Petrolia, March 27th, 1913. 14-15

Tenders Wanted

Bridge Painting

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Bridge Painting," will be received by the Council of the Township of Etobicoke until ten o'clock a.m., **Monday, May 5th, 1913**, for cleaning the steel work of six steel bridges within the Township. For specifications and further information apply to the undersigned.

J. A. L. MACPHERSON, Engineer,
Islington, Ont.
April 9th, 1913. 15-16

The Commissioners of the Transcontinental Ry.

NOTICE TO CONTRACTORS

TENDERS

for 12 Stall Engine House without Machine Shop at O'Brien, P. Q.

Sealed tenders addressed to the undersigned and marked on the envelope, "Tender for 12 Stall Engine House without Machine Shop," will be received at the office of the Commissioners of the Transcontinental Railway at Ottawa, until 12 o'clock noon of the thirtieth day of April, 1913, for the construction and erection complete, in accordance with the plans and specifications of the Commissioners, of a 12 Stall Engine House without Machine Shop, at O'Brien, P.Q., about 113 miles east of Cochrane, Ont.

Plans and specifications may be seen at the office of Mr. W. J. Press, Mechanical Engineer, Ottawa, Ontario; Mr. A. E. Doucet, District Engineer, Quebec, P.Q., and Mr. H. M. Balkam, District Engineer, Cochrane, Ontario.

Tenders must be made on the forms supplied by the Commissioners, and must be signed and sealed by all the parties to the tenders, and witnessed, and be accompanied by an accepted cheque on a chartered bank of the Dominion of Canada, payable to the order of the Commissioners of the Transcontinental Railway, for a sum equal to ten per cent. (10 p.c.) of the amount of tender.

The right is reserved to reject any or all tenders.

By order,

P. E. RYAN,
Secretary.
The Commissioners of the
Transcontinental Railway.
Dated at Ottawa, 22nd March, 1913.

Newspapers inserting this advertisement without authority from the Commissioners will not be paid for it.—38987. 15

Sealed tenders addressed to the undersigned, and endorsed "Tender for Kingston Harbor Improvements," will be received at this office until 4 p.m. on **Wednesday, April 30, 1913**, for the construction of a combined Roadway and Wharf across the Cataraqui River, and Dredging in Kingston Harbor, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Bldg., Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Merchants Bank Building, St. James street, Montreal; A. R. Decary, Esq., District Engineer, Post Office Building, Quebec, and on application to the Postmaster at Kingston, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, March 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—35224. 15-16

Wanted to Purchase

1 30-ton Steam Shovel.
10 Standard gauge 6 or 9 yard Dump Cars.
1 Standard Gauge Locomotive, about 25 tons.
1 Bucket Elevator, capacity 100 cu. yds per hour.

National Sand and Material Co., Ltd.,
14-15 Welland, Ont.

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

FOR SALE

Dredge and Derrick and Tug, Portable Crusher, and 20 horse power Boiler and Engine, 12-ton Case Roller, "steam steerer," 19 Dump Waggons, Wheel and Drag Scrapers, Shovels, Hammers and Picks. All in good working order and cheap. Apply to H. A. Camjaigne, Niagara House, Niagara Falls, Ont. 10-T.F.

FOR SALE

Koehring Concrete Paving Mixer, capacity 14 cu. ft.; used three months, in perfect condition.

20 H.P. Case Traction Engine with contractors fuel bunkers, in perfect condition; used two months.

Three rock drills, good condition. Apply Box 761, Contract Record, Toronto, Ont. 14-16

DO YOU NEED HELP?

If so let us know. We can furnish any amount of skilled and unskilled labor at shortest notice.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
Phone Adelaide 3919. 14-17

Situations Wanted

WANTED—A position as foreman or superintendent with wide experience on sewer or waterworks. Work in West preferred. Box 759, Contract Record, Toronto, Ont. 14-15

Superintendent seeks an appointment; had life's experience on Railway, Dock and Harbor Work. Highest references. Box 764, Contract Record, Toronto, Ont. 15-17

Situations Vacant

WANTED—First class construction foreman, capable of handling reinforced concrete, stone and brick buildings. Carpenter by trade preferred. Navin Bros., Contractors, Moose Jaw, Sask. 14-15

Wanted—Concrete Foreman

Applications will be received up to April 15th, for the position of Foreman in charge of concrete bridge construction for the County of Hastings. Apply in person or by letter, stating experience, qualifications, etc., and wages desired, to

LUCIUS E. ALLEN, C.E., County Engineer,
Office Standard Bank Building,
15 Belleville, Ont.

Residences

(Continued from page 75)

Stone foundation, brick veneer construction. Plans in progress.

Residence, cost $7,000, Monkland, for Edward Oliver, 422 Somerset street. Architect, M. C. Edey, 71½ Sparks. Mason, Chas. Holbrook & Sons, Lewis St. Tenders are being received by owner for other contracts. 2½ storeys, stone foundation, solid brick construction.

Regina, Sask.

Apartment block, cost $50,000, Halifax. Owner and architect, D. T. Dutton, 2312 Halifax. Three storeys, 54 x 90, brick foundation, stone and artificial stone construction. Plans drawn.

Sotuh Edmonton, Alta.

Residence, cost $9,500, 7th West and 5th ave. N., planned for Mrs. Jane Morris, 390 Fraser ave., Edmonton. Architect, David Hardie, Victoria Block, Edmonton. Three storeys, 35 x 36, concrete foundation, brick veneer construction. Work to be done by day labor.

St. Marys, Ont.

Residence, cost [illegible] contemplated for Donald McBeath, Park and St. George street. Architect to be selected. 1½ storey, stone and cement foundation, white brick construction.

Toronto, Ont.

One pair residences, cost $4,000, Wallace ave. Builder and owner, J. S. Beaty, 465 St. Clarens ave. Two storeys, 33 x 42, brick construction. Plans drawn.

Residence, cost $4,000, Eleanor, for D. Mathieson, 221 Ossington ave. Architect, J. H. Stanford, Bloor and Ossington. 2½ storeys, brick construction & foundation. Plans drawn.

Residence, cost $5,000, Indian road, for J. S. Sharpe, 288 Roncesvalles avenue. Architect, J. H. Galloway, 23 Toronto street. 2½ storeys, 23 x 36, brick foundation and construction. Plans ready.

Two detached residences, cost $4,000, Coady ave., for Rev. John Gray, 477 Brunswick ave. Builder, J. Davenport, 572 Spadina ave. Two storeys, 18 x 42, brick foundation and construction. Plans prepared.

Residence, Hain. General contractor and owner, W. McCabe, 34 Hain avenue. Architect, T. Harris, 43 Howard Park ave. Tenders received by owner, still open for all trades except foundation.

Two detached residences, cost $4,000, Woodycrest. Builder and owner, W. H. Howard, 19 Englewood ave. Two stys., 22 x 36 each, brick foundation and construction. Plans ready.

Two pair residences, cost $9,600, Shaw street. Builder and owner, Thos, Edmonds, 139 Symington ave. 2½ storeys, 32 x 40, brick construction. Plans prepared.

Residence, Heath and Parkwood, for John Wickett, care architect, E. G. Wilson, 77 Victoria street, who will receive tenders until April 10th. Brick foundation and construction.

Three attached residences, cost $4,500, Chester. Builders and owners, Crawford & McClintock, 70 Ferrier. Two storeys, 48 x 36, brick construction and foundation. Plans ready.

One detached residence, cost $5,900, Wells Hill, for L. E. Farrow, 51 Parkwood ave. Architect, J. Hunt Stanford, Bloor and Ossington. 2½ storeys, 32 x 34, stone foundation, brick construction. Plans drawn.

Seven attached residences, cost $30,000, Homewood ave., for W. A. Forster, 12 Grove ave. Architect, J. Hunt Stanford, Bloor and Ossington. 2½ storeys, 15 x 72 each, brick construction, stone foundation. Plans drawn.

Two detached residences, cost $9,500, Lonsdale, for J. R. Marshall, 601 Parliament street. Architect, J. Hunt Stanford, Bloor and Ossington. 2½ storeys, 26 x 37, stone foundation, brick construction. Plans drawn.

Residence, cost $4,000, 81 Indian Grove, for D. C. Smith, 33 Rose ave. 2½ stys., 24 x 40, brick construction and foundation. Plans drawn.

One pair residences, cost $6,000, Eleanor ave., for H. H. Horwood, 491 Concord ave. Architect, G. Miller, 1050 Dovercourt road. 2½ storeys, 36 x 42, brick brick construction, stone foundation. Plans drawn.

Two pair residences, cost $10,000, Browney, for C. C. Kurtz, Arundel ave. Architect, P. H. Finney, 79 Adelaide E. [illegible] construction and foundation. Plans drawn.

One detached residence, cost $3,500, for Mr. McBride, 163 Quebec ave. Architect, W. Fraser, 34 Victoria street. Two [illegible] brick foundation and construction. Plans drawn.

Vancouver, B.C.

Apartments, Fraser ave. and 26th St., for R. M. Humphries. Architects, Towns[illegible] & Townsend, [illegible] Granville street. Three storeys and basement, [illegible] pressed brick construction, granite trimmings. Plans prepared.

Victoria, B.C.

Apartments, cost $300,000, Blanchard & Quadra streets, for C. C. Pemberton and H. M. Leonard, 601 Sayward Bldg. Architects, Jennings & Boulanger. Six storeys, reinforced concrete construction, fireproof, sound proof walls, marble entrance, 2 high speed elevators, telephone system. Plans prepared.

Westboro, Ont.

Residence, cost $5,000, Golden ave., Highland Park, for J. Clark, City View. Stone foundation, brick veneer construction. Plans in progress.

Windsor, Ont.

Residence, cost $8,000, Louis, for G. Adams. Architects, G. Jacques & Co., Boug Bldg. Two storeys, 46 x 40. Plans prepared.

Winnipeg, Man.

Two residences, cost $8,000, Morley ave. Architect and general contractor, S. Cohen, 502 Magnus ave. Two stys., 18 x 32, stone foundation, frame construction. Foundations in.

CONTRACTS AWARDED

Belmont, Ont.

Residence, cost $3,500. Owner and builder, W. S. Hamlyn, Belmont. 1½ storeys, stone and cement foundation, white brick construction.

Edmonton, Alta.

Residence, cost $3,600, Gallagher, for Frank Becker. Architect and general contractor, A. Scheider. Two storeys, 30 x 38, frame construction, concrete and cement foundation. Excavating done.

Rooming house and residence, cost $10,000 8th street, for Mrs. Tournier and Clara Rabier, care general contractor and architect, H. F. Martel, 257 Donald St. 2½ storeys, 34 x 58, concrete foundation, frame construction. Excavating done.

Apartments, cost $35,000. Owner and general contractor, W. J. Baldry. Four storeys, 33 x 80, brick foundation, sand lime brick construction. Excavating done.

London, Ont.

Residence, cost $7,000, 26 Cartwright street, for J. E. Boomer, 314 King street. Masonry, T. W. Copp, 31 Beaconsfield ave. Carpentry, Robt. Jefferies, 419 Simcoe. Plastering, W. Scott, 23 Elmwood ave. Two storeys, 45 x 48, brick construction, brick foundation.

Montreal, Que.

Alterations to residence, cost $7,000, Dorchester W. Owner and builder, Jerome L. Decarle, 9 St. James street. [illegible] storeys, 20 x 60, stone foundation, cut stone and solid brick construction.

Three flats, cost [illegible] Marlowe. Owner and builder, Joseph Boulin, 418 Marlowe. Three storeys, 25 x 40, cement foundation, frame and brick construction, felt and gravel roofing.

[illegible] stic. Owner and builder, Arthur Hamel, 6269 Peloquin. Two storeys, 25 x 42, concrete foundation, 3-in. plank, frame and brick construction.

Six flats, cost $7,000, St Lawrence Blvd. Owner and builder, T. Frank, 101 [illegible]

[illegible] storeys, stone foundation, brick veneer construction. Excavating done.

South Edmonton, Alta.

[illegible] street. Architect, P. G. Armour. General contractor, J. R. Robinson. Two storeys, 32 x 30, brick foundation, frame construction. [illegible]

Toronto, Ont.

Four residences, cost $16,000, Pleasant ave., for W. J. Greenaway, 37 Hewitt. Builder, Thos. Harris, 43 Howard Park ave. Two storeys, 25 x 42, stone foundation, structural steel and brick construction.

Four pair residences, cost $22,500, Willow ave. Architect and builder, E. G. McBride, 14 Cedar ave. Owner purchases all material. 2½ storeys, brick construction and foundation. Excavating started

Apartment, cost $6,000, Enderby. Owners and builders, McMillin & Costain, 200 Main street, East Toronto. Three stys., 36 x 52, structural steel and brick construction, cement foundation.

Detached residence, $3,400, Indian Rd. Owner and builder, W. J. White, 108 Geoffrey street. Two storeys, 22 x 42, brick construction, stone foundation.

Residence, cost $4,500, St. Leonards. Owner and builder, E. H. Yeigh, 410 Kent Bldg. 2½ storeys, 22 x 36, brick construction and foundation. Plans drawn.

One pair residences, cost $5,600. Owner and builder, Geo. Rennie, 15 Smith ave., Eglinton. 2½ storeys, 33 x 42, brick construction, stone and brick foundation.

Two detached residences, cost $8,000. Owner and builder, R. Dale, 16 St. Andrews Gardens. Two storeys, 22 x 36, brick construction and foundation.

One detached residence, cost $4,800, Oakmount, for W. V. Prichard, 350 Shaw street. Builder, J. Marshall, 114 Harrison. 2½ storeys, 29 x 42, brick construction, stone foundation.

One pair residences, cost $5,000, Stonehouse Cres. Owner and builder, W. T. Richardson, 180 Gladstone ave. 2½-storeys, 40 x 42, brick construction and foundation.

Winnipeg, Man.

Four residences, cost $16,000, Rosser ave. Architect and general contractor, T. McHattie, Suite 2, 846 Main street. 2-storeys, 21 x 30, stone foundation, frame construction. Excavating done.

Power Plants, Electricity and Telephones

Edmonton, Alta.

Street railway extension. Clerk, C. Cox. City Engineer, A. J. Latornell. The council decided to lay ten miles more of railway. From Highlands to Beverly Heights; up First street to Alberta ave. and west; from Whyte ave. to 19th ave. south along 7th street and east and along 19th to 10th or 12th street, then up either of these streets. The property owners by which this railway passes are bearing the expense.

Ottawa, Ont.

Extension to electric railway, cost $50,000, to Brockville, planned by the Morrisburg & Ottawa Electric Railway Company, Canada Life Bldg., Sparks street. President, J. G. Kilt, Citizen Bldg. Engineer in charge, company's engineer, Canada Life Bldg. Line to Brockville is additional to that already reported. Surveys will shortly be made.

Port Arthur, Ont.

Telephone pole equipment. Tenders received by Commissioner of Utilities, J. J. Hackney, until April 21st. 600 4-pin cross arm, 2 coats metallic paint; 600 6-pin cross arm, 2 coats metallic paint (special spacing); 400 10-pin cross arm, 2 coats metallic paint; 6000 top pins, locust or birch; 2400 cross arm braces, galvanized; 6000 pole steps, 5/8 x 10-in., galvanized; 6000 glass insulators, D.G.D.P.; 400 strain insulators, white No. 506; 5000 No. 4 porcelain knobs. To be delivered by lake and rail as required. Certified cheque of 10 per cent. of amount of tender to accompany it.

Telephone line supplies. Tenders received by Commissioner of Utilities, J. J. Hackney, until April 21st. 12,000 ft. of 400 pair cable, 25-25 prs. Cantops with 5/8 cable, 30-15 prs. Cantops with cable, 25-10 prs. Cantops with cable, 500 protectors, No. 58 a complete 10,000 paper sleeves, 800 lbs. lead sleeving, 8,700 ft. of 4 multiple clay conduit, 600 lbs. wiping solder "easy wiping." To be delivered lake and rail as required. Certified cheque for 10 per cent. of each tender to accompany it.

Electric wire. Tenders received by Commissioner of Utilities, J. J. Hackney, until April 21st. 6 tons No. 2/0 stranded D.B.W.P. wire; 6 tons No. 1/0 stranded D.B.W.P. wire; 5 tons No. 6 solid D.B. W.P. wire; 2 tons No. 10 solid D.B.W.P. wire; 1 ton No. 12 solid D.B.W.P. wire. To be delivered boat and rail as required. Certified cheque for 10 per cent. of tender to accompany it.

Electric wire. Tenders received by Commissioner of Utilities, J. J. Hackney, until April 21st, for 100,000 ft. of style "B" wire, No. 18; 20,000 ft. of style "C" wire, No. 20; 20,000 ft. of pot head wire, No. 22; 4000 lbs. messenger wire; 1000 lbs. guy wire. To be delivered by lake and rail as required. Certified cheque for 10 per cent. of amount of tender to accompany it.

Regina, Sask.

Underground conduit, cost $15,000, contemplated by Provincial Government, Dept. Railway, Telegraphs & Telephones. Deputy Minister, D. C. McNab. Plans are being prepared for about 1½ miles of telephone conduit and 1½ miles of trenching 6 ft. deep.

St. Thomas, Ont.

Transmission line, cost $750,000, to Windsor, planned by Ontario Hydro-Electric Power Commission, Bay and Richmond street, Toronto. Towers and footings, Canadian Bridge Co., Walkerville, Ont. Insulators, Canadian Porcelain Co., Hamilton. Malleable iron clamps, Galt Malleable Iron Co., Galt, Ont. Electric Equipment, Canadian Westinghouse Co., Hamilton. Pressed steel clamps, W. H. Dunne, 1492 Queen street west, Toronto. Work will start May 1st.

Vernon, B.C.

Tenders received by Clerk, D. G. Tate, until April 18, for supply and installation of one 500 h.p. B.H.P. Diesel engine; one 375 kw., 2300 volt, 3-phase, 60 cycle generator with direct connected exciter, and one 10-ton travelling crane. Specifications at offices of Clerk, Engineers, and MacLean Daily Reports, Ltd., Toronto. Consulting Engineers, Mather, Yuill & Co., 413 Granville street, Vancouver, B.C.

Welland, Ont.

Plans are in progress for extensions to electric railway. Manager, C. J. Laughlin.

Winnipeg, Man.

Council have passed resolution for ornamental street lights on Colony street from Ellice avenue to Assiniboine River. Cost $7,500. Board of Control. Secretary, M. Peterson. Engineer, J. G.

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70¼	6¼″ x 8″ " " Double Drum, 36″ x 75″ "	8,400 "
71	7″ x 10″ " " " " 40″ x 84″ "	10,200 "
71½	7″ x 10″ " " " " (without Boiler)	5,700 "

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54	7″ x 10″, Reversible Link Motion - - - -	5,200 "
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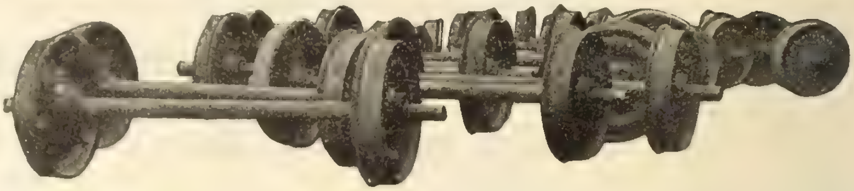

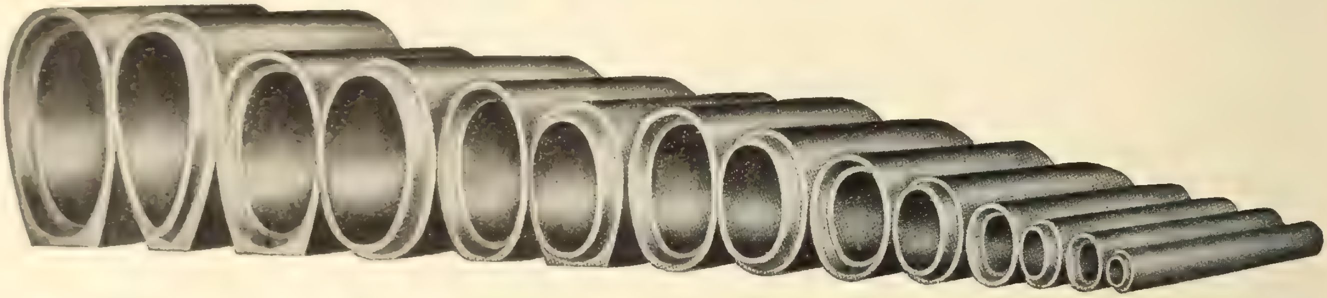

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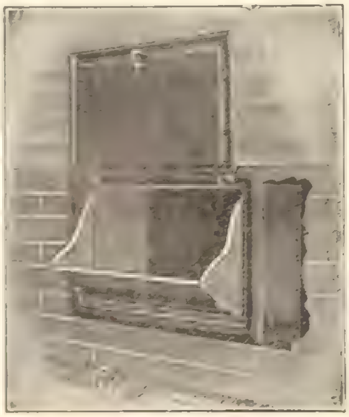

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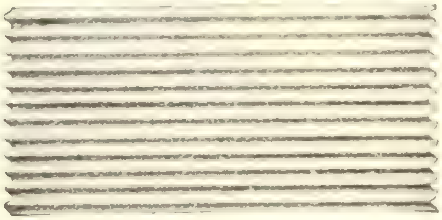

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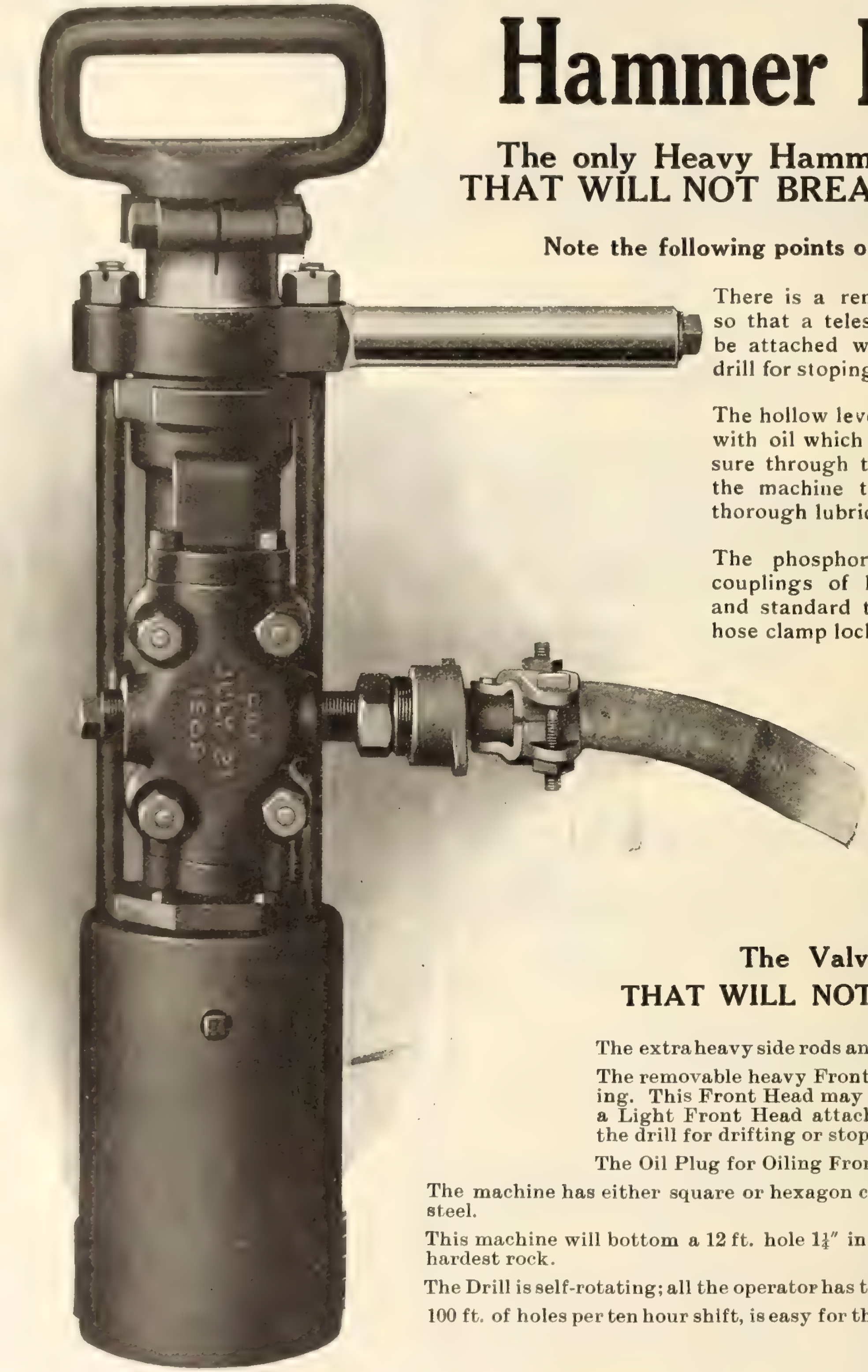

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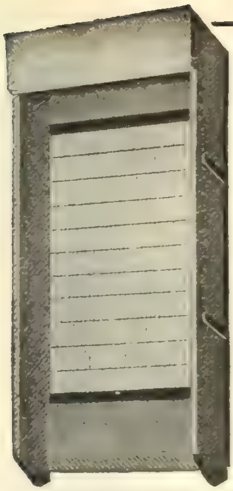

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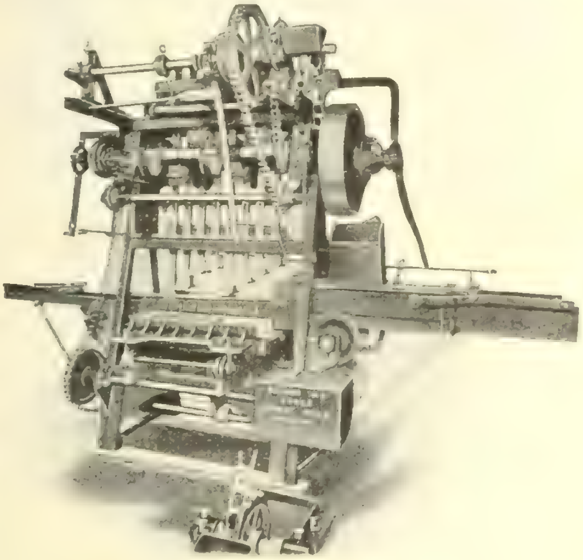

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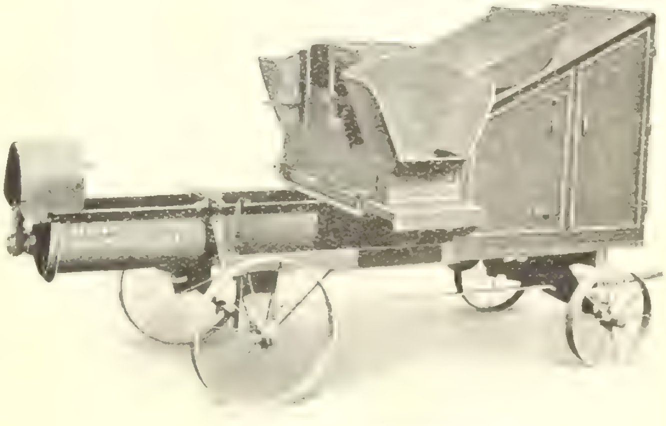

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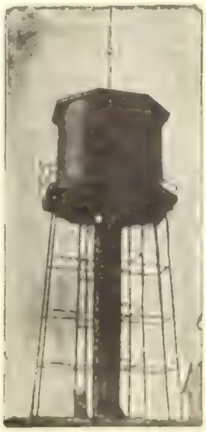

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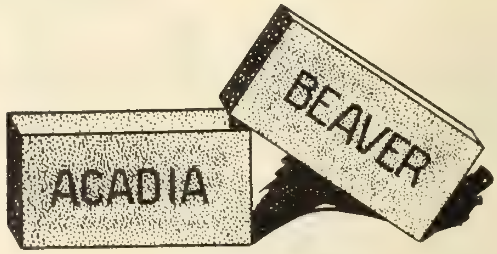

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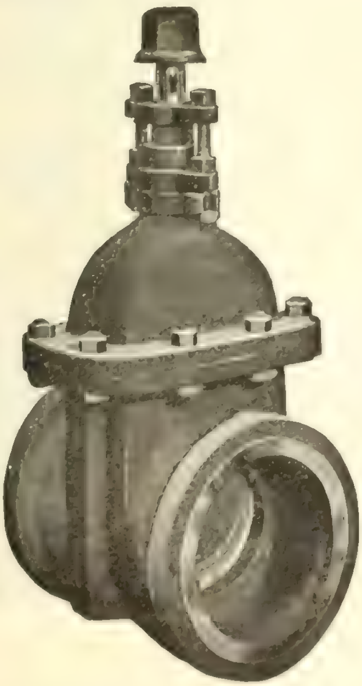

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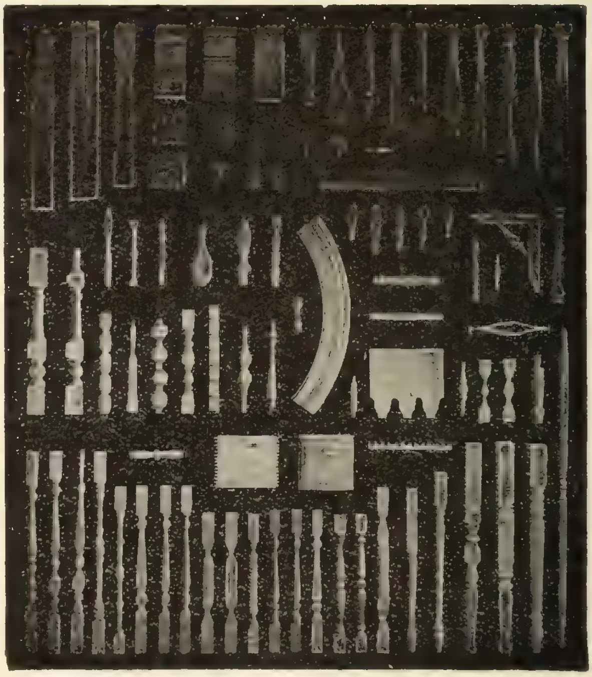

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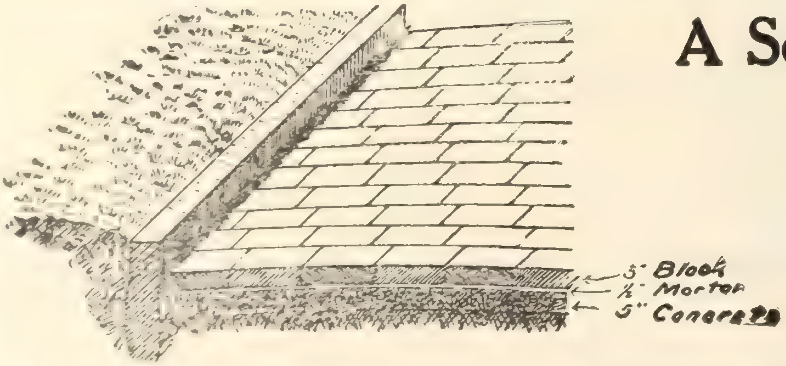

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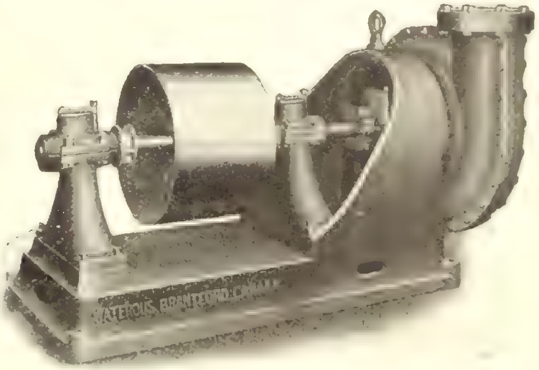

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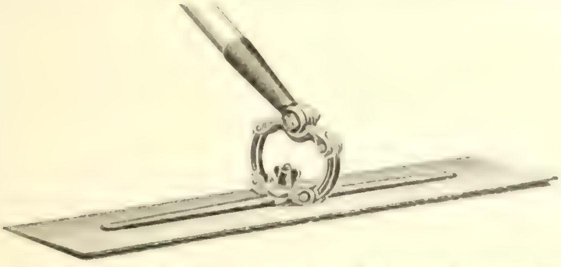

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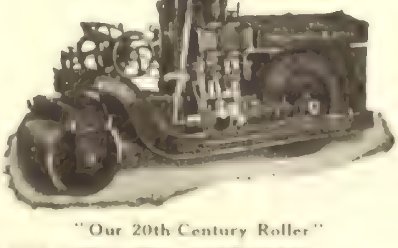

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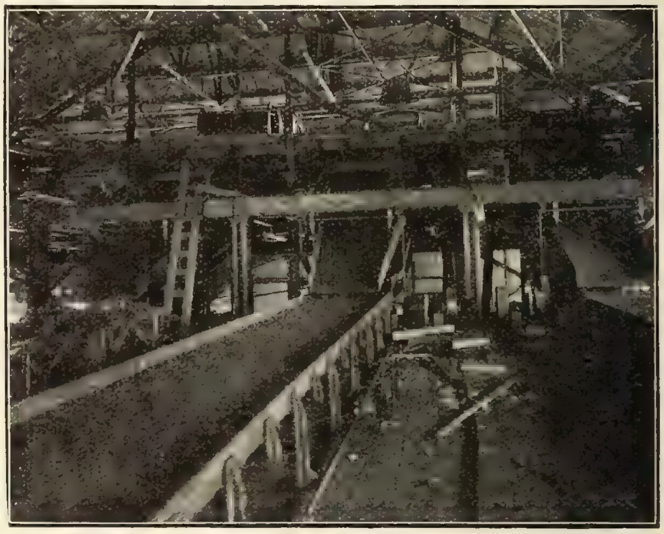

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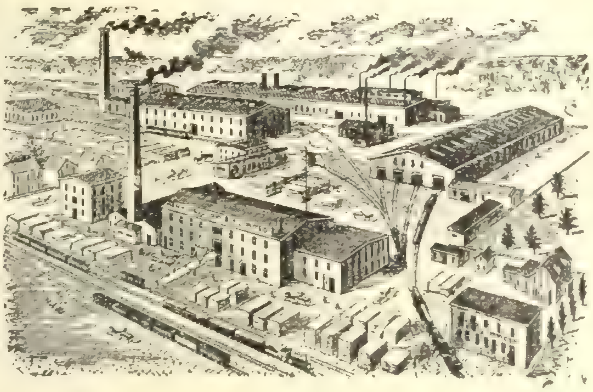

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Hints for Carpenters, by Albert Fair. Published in 1909 by the Industrial Book Company, New York. 144 pages, illustrated. Price 50c.

Modern Plumbing, illustrated, by R. M. Starbuck. Published in 1907 by Norman W. Henley Publishing Company, New York. 329 pages, illustrated. Price $2.00.

Reinforced Concrete, by A. W. Buel. Published in 1906 by the Engineering News Publishing Company, New York. 500 pages, illustrated. Price $1.00.

The Sanitation of a Country House, by Dr. Harvey A. Bashore. Published in 1905 by John Wiley & Sons, New York. 98 pages, illustrated. Price 50c.

Modern Practical Carpentry, by George Ellis. Published in 1906 by B. T. Batsford, London. 372 pages. Price $1.50.

A Practical Treatise on the Steel Square, by Fred T. Hodgson. Published in 1904 by Frederick J. Drake & Company, Chicago. 222 pages, illustrated. Price 50c.

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For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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3 inches to 60 inches diameter

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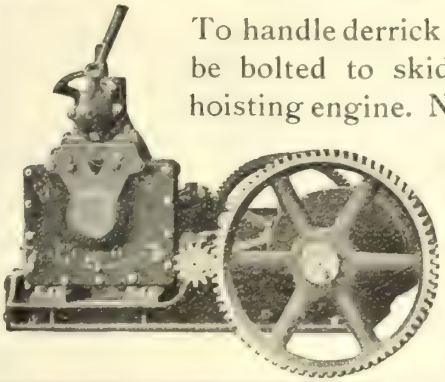
To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.



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"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

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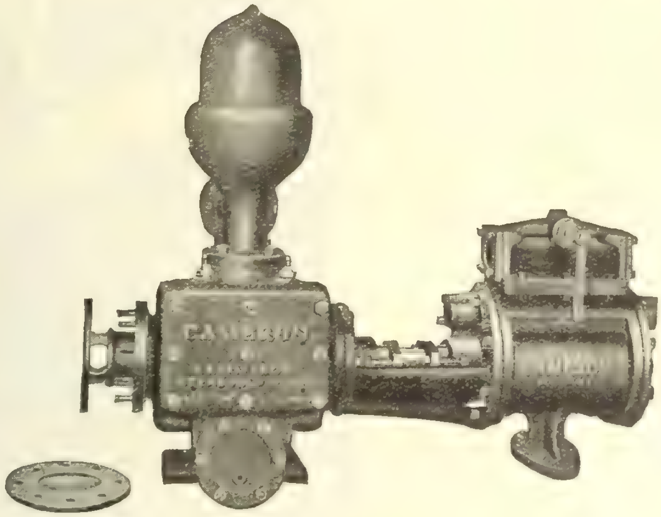

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The Removable Bushing, in addition to extending the life of the pump and ***rendering it capable of taking care of very gritty water,*** can, when it becomes necessary to lower the pump, be replaced by a bushing of smaller diameter, thus changing the proportions of the pump, and enabling it to work against a greater head.

The Bushing can be turned in the pump so that the wear, which is usually greatest on the bottom, can be gradually distributed over every portion of its surface.

The fact that ***the Removable Bushing can be taken out and replaced without raising the pump to the surface,*** warrants the installation of this type of Cameron Pump on general contracting work.

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Sydney Montreal Toronto Cobalt South Porcupine Winnipeg Lethbridge Rossland Vancouver

Current Prices of Building Material.

BRICKS

The [illegible] are wholesale prices delivered at [illegible]

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
[illegible] Stock Bricks	13 00
Wire cut bricks for foundation work	12 00
[illegible] bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	27 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving	36 00	40 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	27 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8 in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 75
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts Fence

5 in. at small end, each	25
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
85	5 30	8 25
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent.; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock .... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 60 per cent.

Lead Pipe

Lead pipe, $7.50 net, less 10 per cent.; lead waste, $9.00 net, less 10 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 30 per cent.; pig lead, 6½c. lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.04	¼ inch	$2.86
⅜ "	2.04	⅜ "	2.86
½ "	2.72	½ "	3.57
¾ "	3.16	¾ "	4.31
1 "	4.54	1 "	6.19
1¼ "	6.19	1¼ "	8.44
1½ "	7.43	1½ "	10.13
2 "	9.90	2 "	13.50
2½ "	15.80	2½ "	21.56
3 "	20.75	3 "	28.31

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a yard, f.o.b. Toronto siding.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 61c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 58c. per gal. of 9 lbs.

Turpentine, in barrels, 66c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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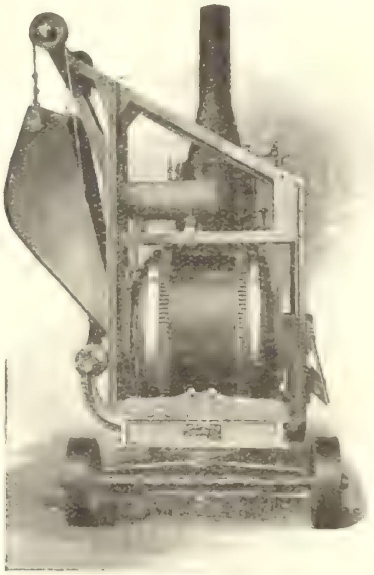

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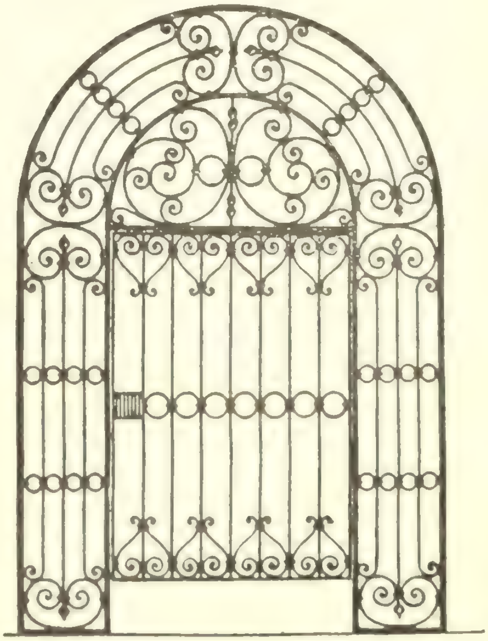

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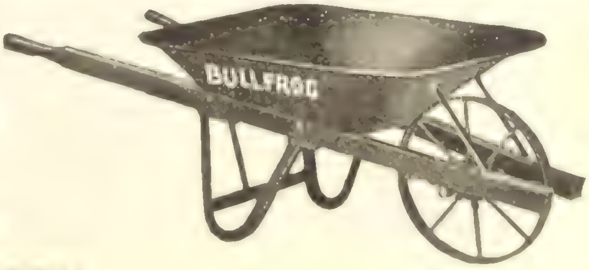

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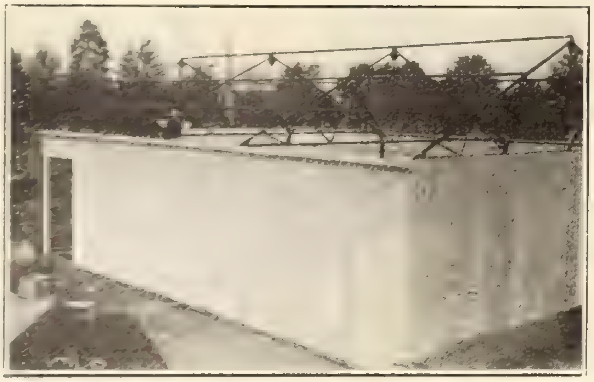

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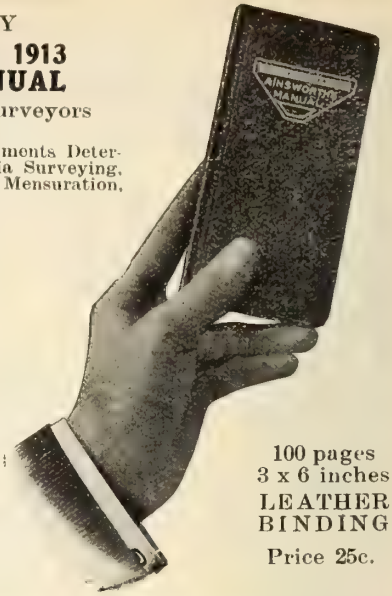

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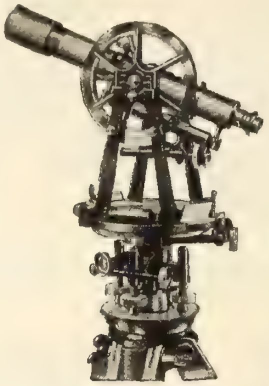

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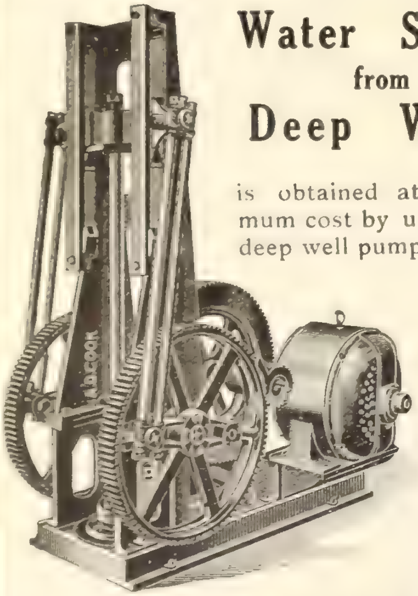

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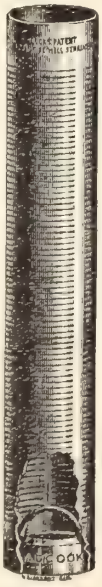

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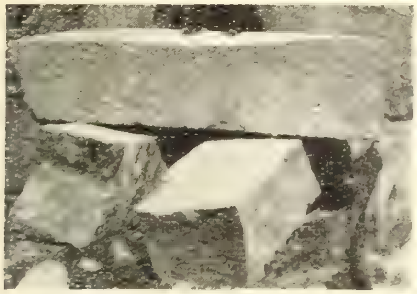

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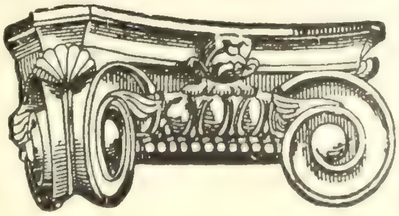

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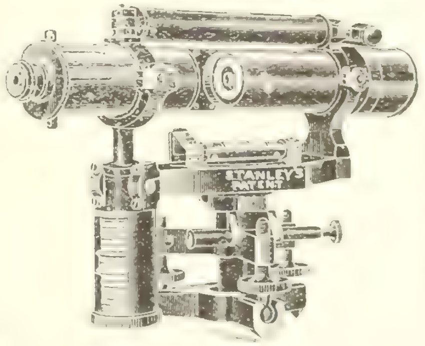

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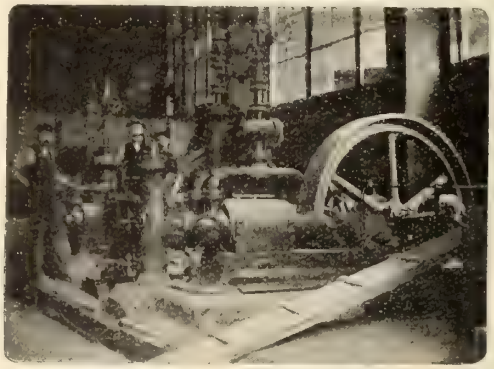

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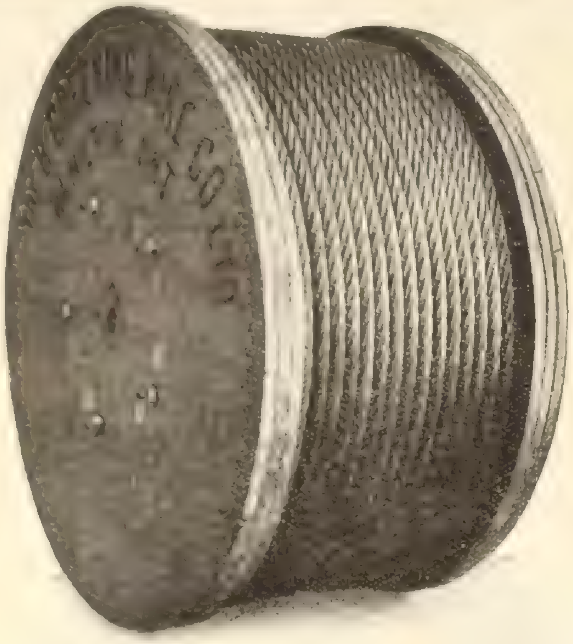

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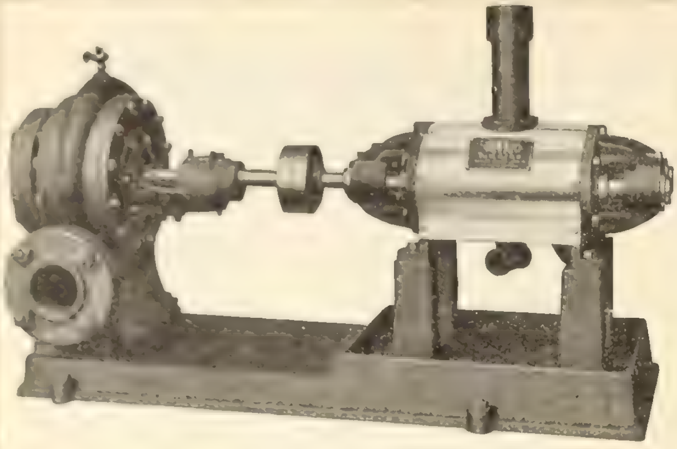

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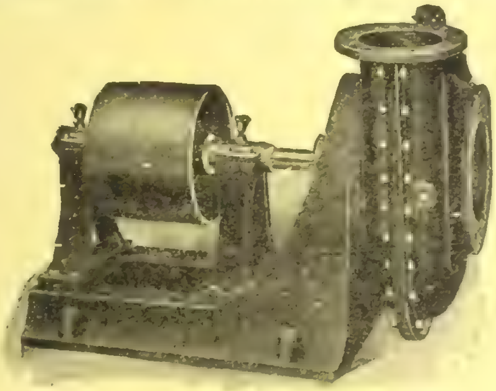
Vol. 27 Toronto, April 16, 1913 No. 16

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps,
Condensers, Travelling Cranes



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Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

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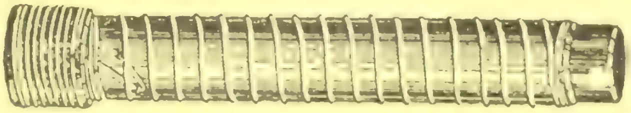

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Full Particulars and Estimates Furnished

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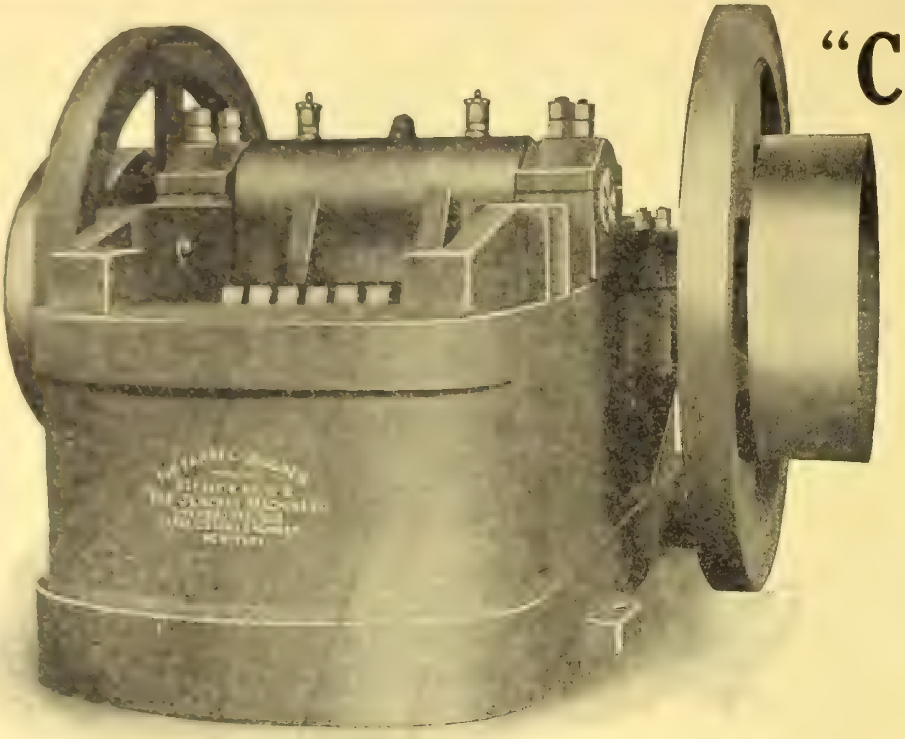

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Complete Crushing Plants

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Many Years Experience and Exceptional Facilities

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of a heavily loaded derrick produces thousands of pounds of stress on certain parts.

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ARE SAFE AND STRONG

They are designed by skillful engineers and built of material that for 28 years has stood the severest shocks and strains.

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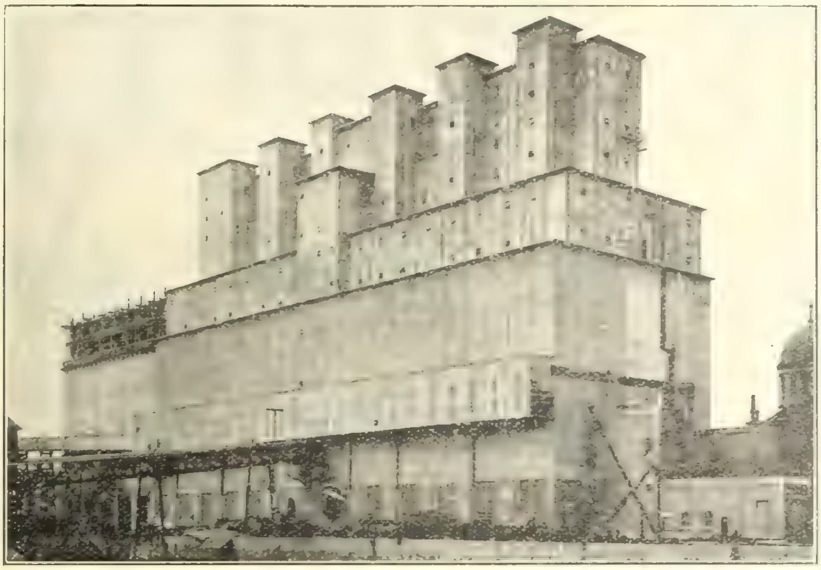

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The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

Canada Cement Company
Limited
Montreal

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"Forced Feed" Crusher

For Contractors, Quarries,
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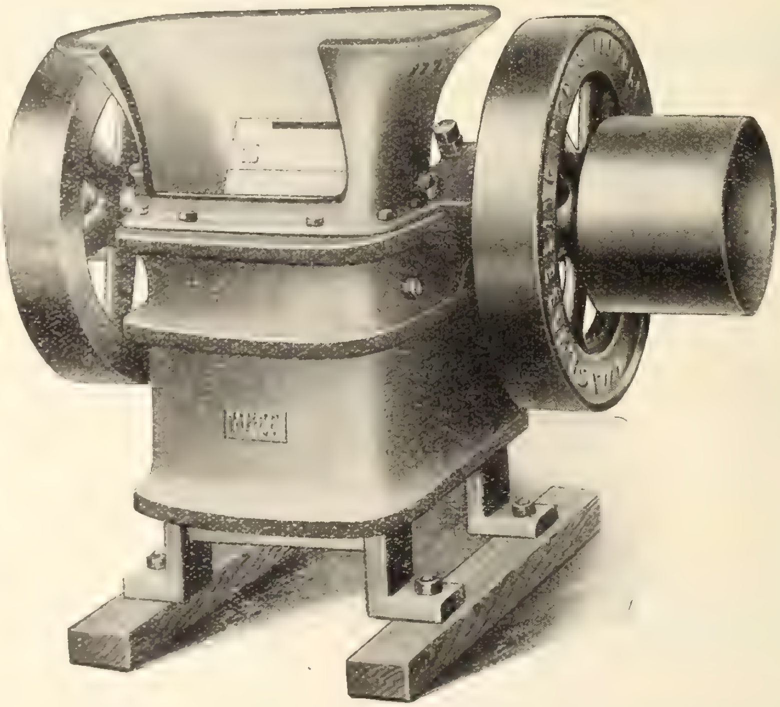
Will withstand the crushing strain of the very hardest materials.

Is made of steel throughout.



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Capacities ranging from as small as one ton of sand to forty tons of two and one-half inch rock per hour.

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STUDY

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We give you SEVEN important and distinctive features of its superiority :

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5th—Extreme Accessibility and Convenience in Feeding.

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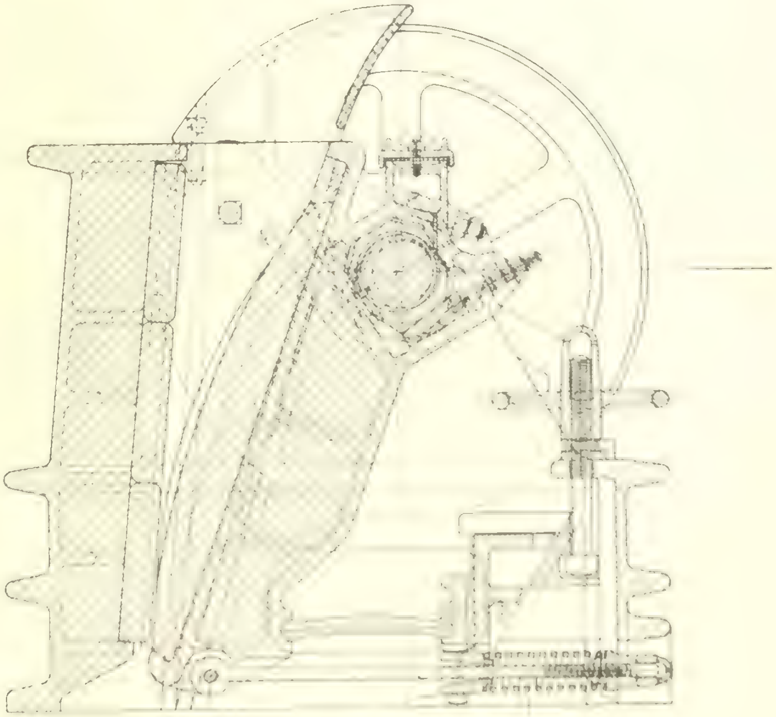

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(Continued on page 12)

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For over twelve years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

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Don Valley Fireproofing, Bricks and Tile used throughout.

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Don Valley Porous Terra Cotta Fireproofing and 2,000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

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Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

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The illustration shows one of the first reinforced concrete bridges in America and the first in Canada.

Completed less than three years ago it has proved such a success that over two hundred highway bridges throughout Canada have been erected along similar lines.

Rod reinforcement was used for all portions except the floor slabs which were reinforced with

"Steelcrete" Expanded Metal

If you have a stream to cross, erect a permanent crossing—a **"Steelcrete"** reinforced bridge. Are you in touch with our designing department?

Steel and Radiation, Limited

Toronto, Canada

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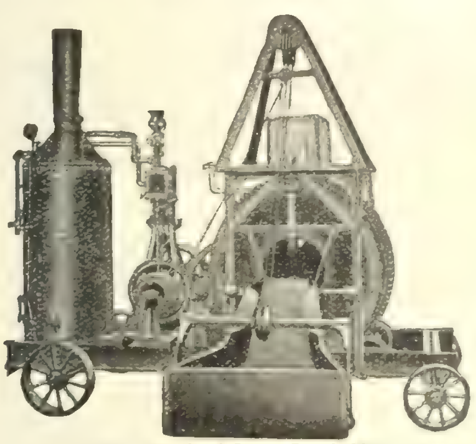
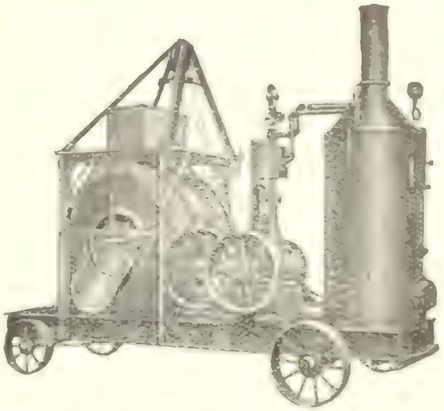


London Standard Drum Batch Mixer

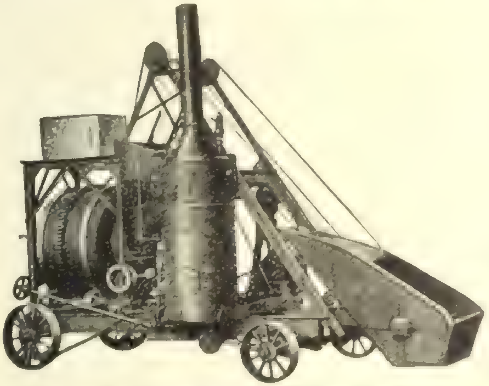
must be built Strong and of the Best Material.

The First Cost of a Concrete Mixer is only a Small Item if it is continually breaking down.



London Standard Drum Batch Mixer

The London Mixers are built **up to a Standard** not down to a price. **By manufacturing on a large scale** we have been able to sell **High Grade Machines** at Remarkably Low Prices.



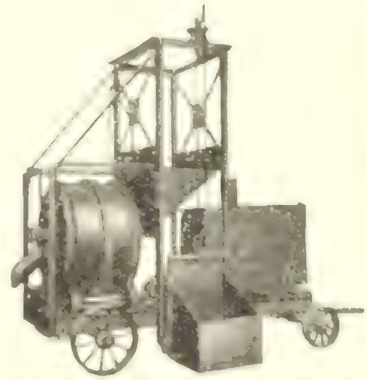
London Paving Mixer with Front Loader and Rear Discharge

We manufacture a complete line of Concrete Machinery and Cement working Tools and Contractors' Equipment.

London Mortar Mixer

London Automatic Batch Mixer No. 1

Ask for our 1912 Catalogue. It contains information for every Contractor.



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London Concrete Machinery Co. Limited

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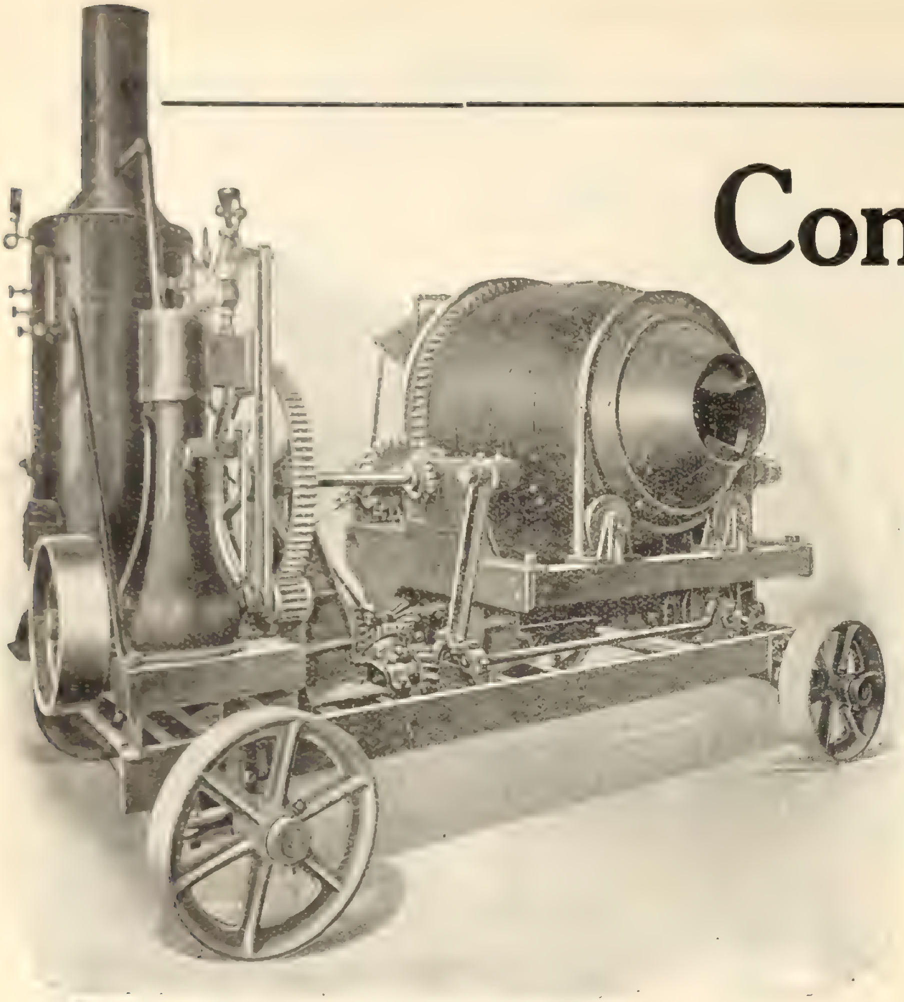

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Are
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Ready
for
Spring
Business
?

Is your mixer in good shape for handling that new Contract? If not—get into line with the live ones and use a

Wettlaufer Heartshape Mixer

and you will always be prepared for Big Work. The experience of others has proved it and we can show you.

Send for catalogue and come and see the Mixer Working

Continuous demonstration at

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AND
CRUSHED STONE

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built of concrete made with Rogers' cement and crushed stone will last as long as the city itself, requiring the minimum of repairing. See that your contracts call for Rogers materials.

Cement and crushed stone from our mills are always of uniform quality.

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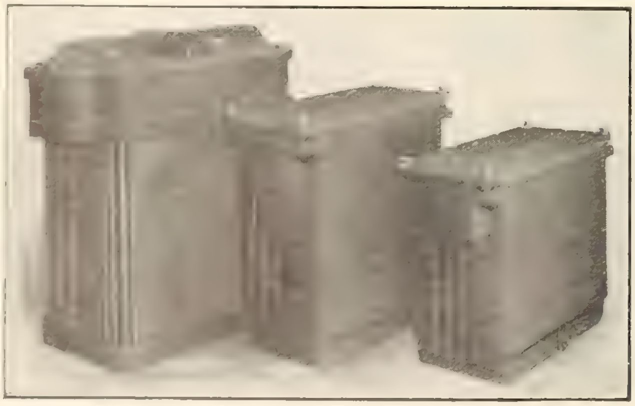
Power Logic

Reduced Loss
Increased Profit

Ferranti
Transformers



Three Phase Pole or Station Transformers

The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one becausee of the great reduction in energy-loss made posible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction costs.

Write us for particulars

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

WESTERN DUMP CARS

can be dumped and righted by fewer men and in less time than required for the same operation on many other cars

Prominent Contractors have made the above statement time and time again, and its a proven fact. Just think of the saving.

Western Air Dump Cars are used by many of the largest Railroads and at the Panama Canal. There must be many reasons.

Let us tell you them.

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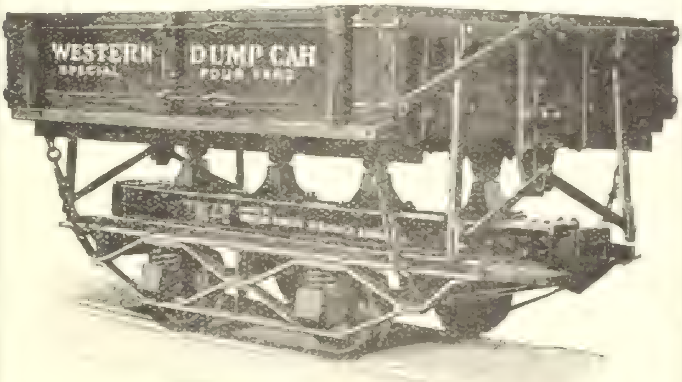

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The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or $5\frac{2}{3}$c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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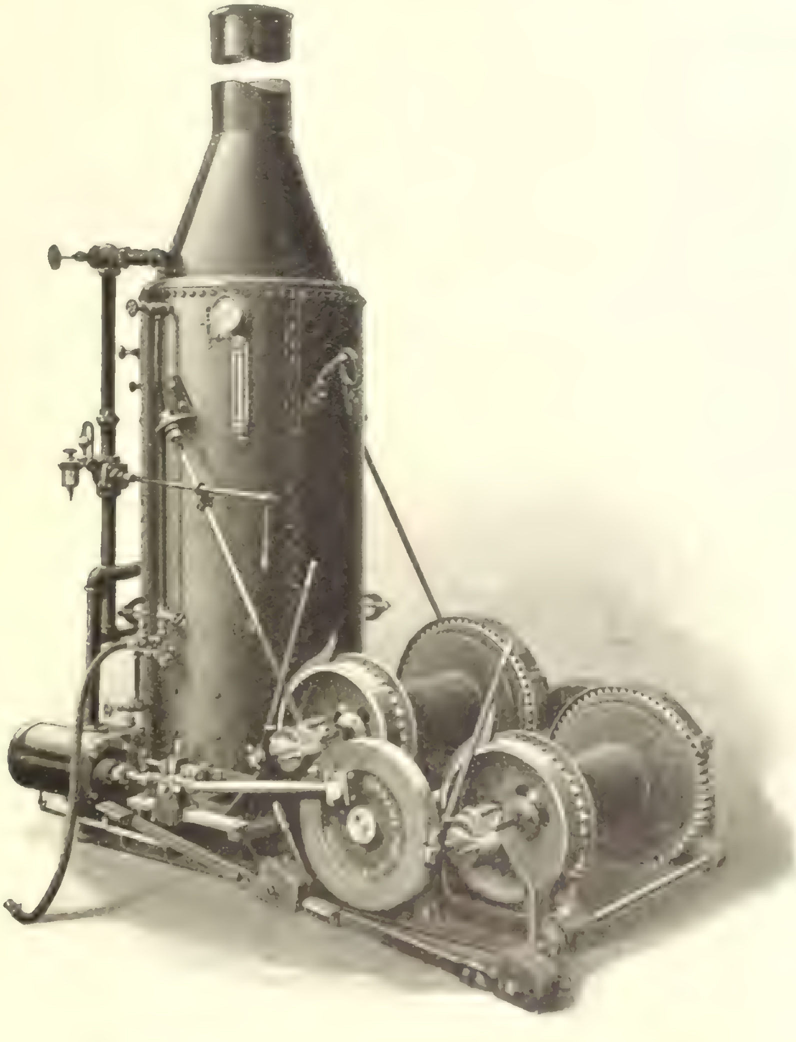

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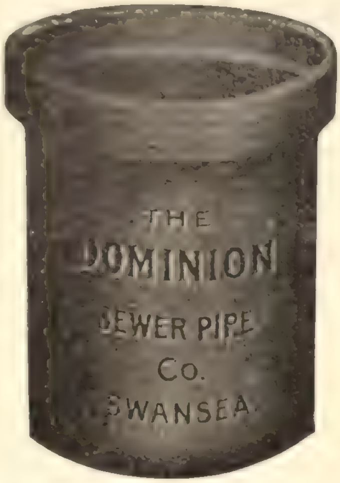

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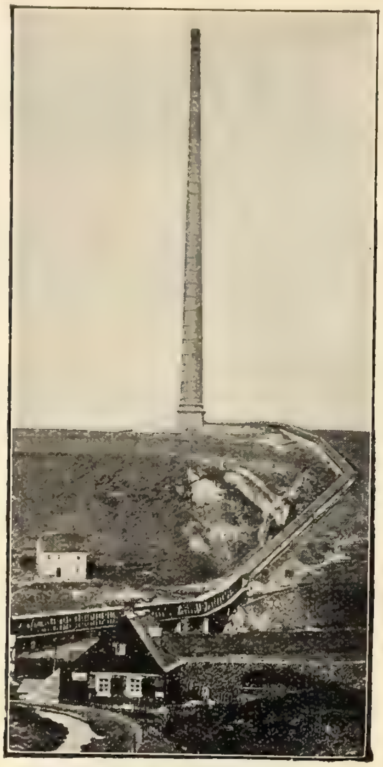

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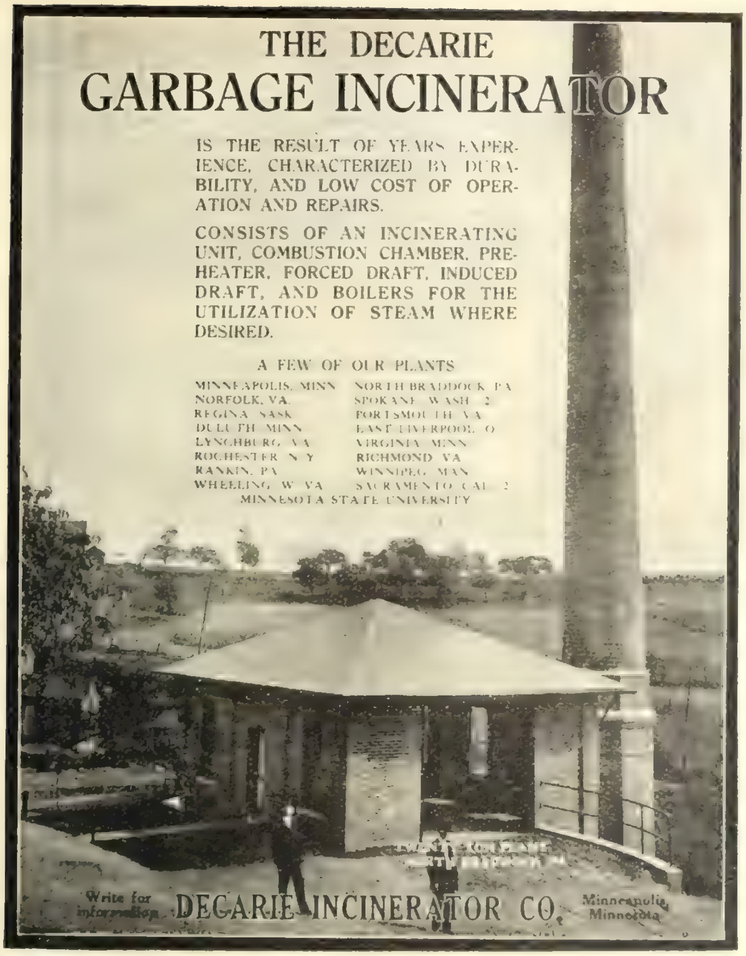

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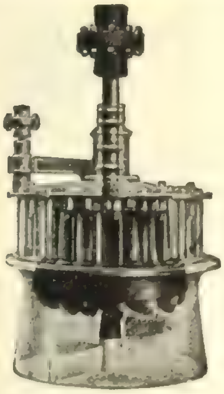

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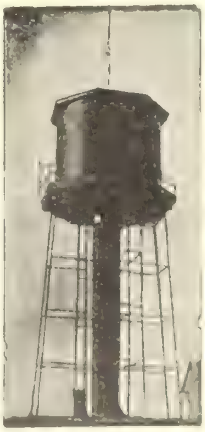

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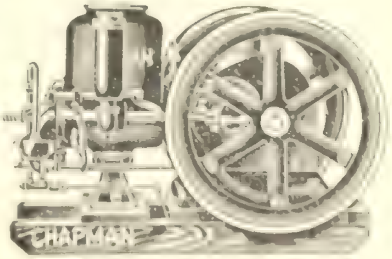

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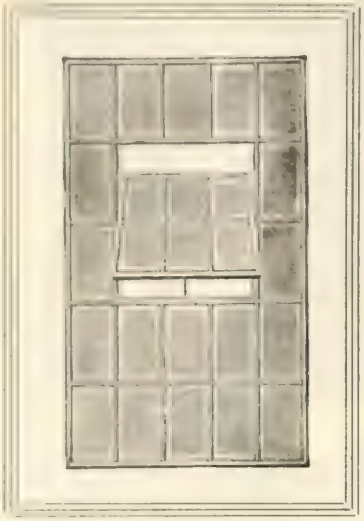

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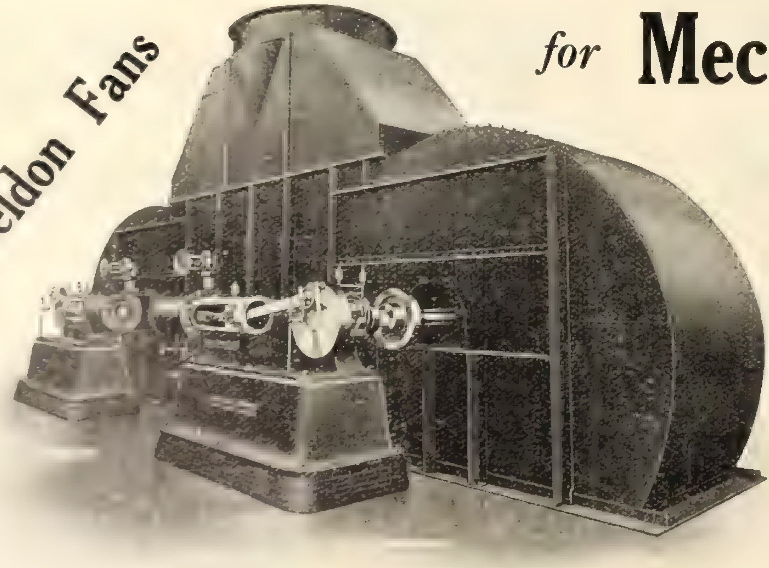

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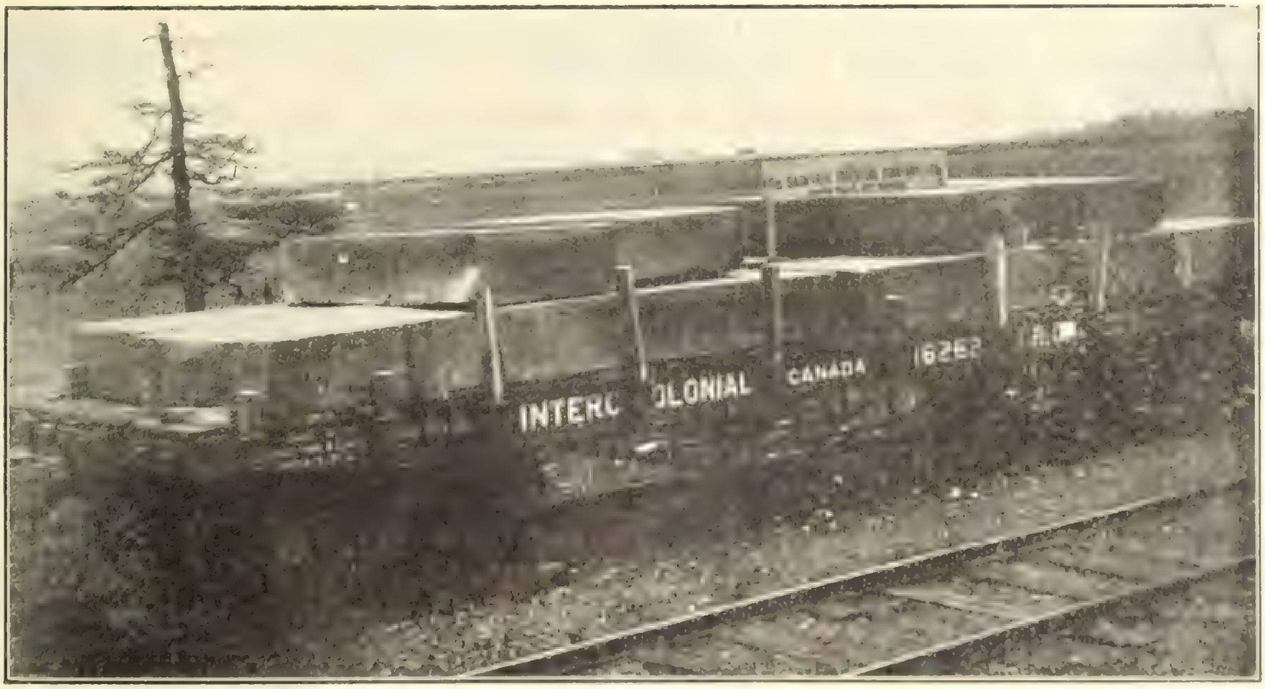

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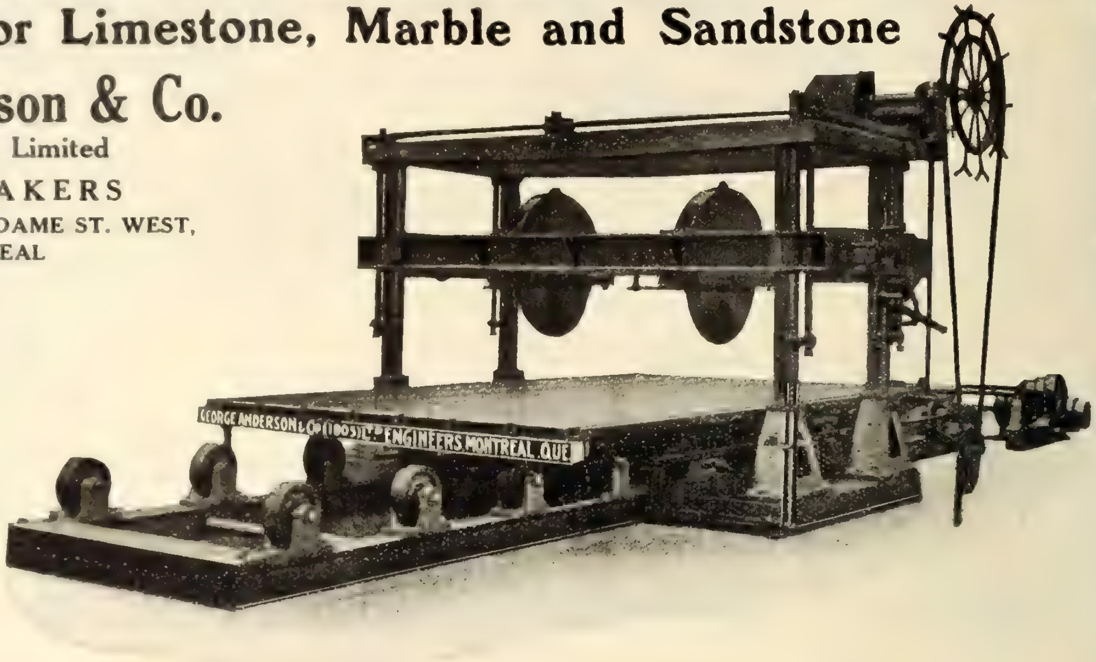

Anderson's Rising and Falling Diamond Saw, made under British and U.S.A. Patents 209179, 657262 **SINGLE AND DOUBLE TABLES**

About 50 of the above Machines at work in Canada

A Successful Architect can make One Dollar

Spent in Construction do the work for which Another Will Need Two Dollars

All baggy places in metal lath have to be filled out with plaster.

Herringbone Metal Lath, (the Ribbed Kind) does not bag.

All plaster that drops between the studs is wasted.

Herringbone Metal Lath, (the Ribbed Kind) does not drop plaster between the studs. The ribs act as shelves and hold the clinch in place.

Diamond mesh lath is only satisfactory on twelve-inch spans.

Herringbone Metal Lath, (the Ribbed Kind) spans sixteen inches. Leave out all cross-furring. Place it directly on the joists and save nine cents per yard.

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117 Home Life Building, TORONTO
Metal Shingle & Siding Company, Manufacturers

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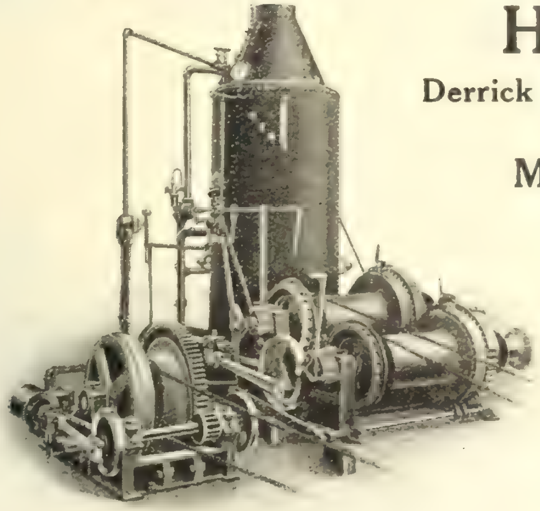
Doty Marine Engine and Boiler Co., Ltd.

Manufacturers of SUPERIOR

HOISTING ENGINES

Derrick Swingers, Material Elevators, Safety Mine Cages, Etc.

MARINE ENGINES BOILERS



The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.

Doty Engine Works Co. of Winnipeg, Ltd.
Foot of Water Street, WINNIPEG, Man.

Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT

The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

It will pay you to investigate this shovel. Write for our catalog, C. R. It will explain the numerous features which make the Thew the most practical and economical machine of its kind on the market and will give you valuable information regarding cost of excavating.

The Thew Automatic Shovel Company, Lorain, Ohio

We make
20 lb. Section Rails
25 " " "
30 " " "
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60 Tons 25 lb. Rails, Ready for Shipment
500 " 30 " " "
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We hold stocks of
20 lb. Fishplates
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MERCHANT BARS	ROUNDS and SQUARES	FLATS	ANGLES
	3/8 to 2-in.	3/4 x 1/8 to 4 x 1	3/4 x 1/8 to 2 1/2 x 1/2

Cold Twisted Squares for Concrete Re-inforcing made from New Steel Billets only.

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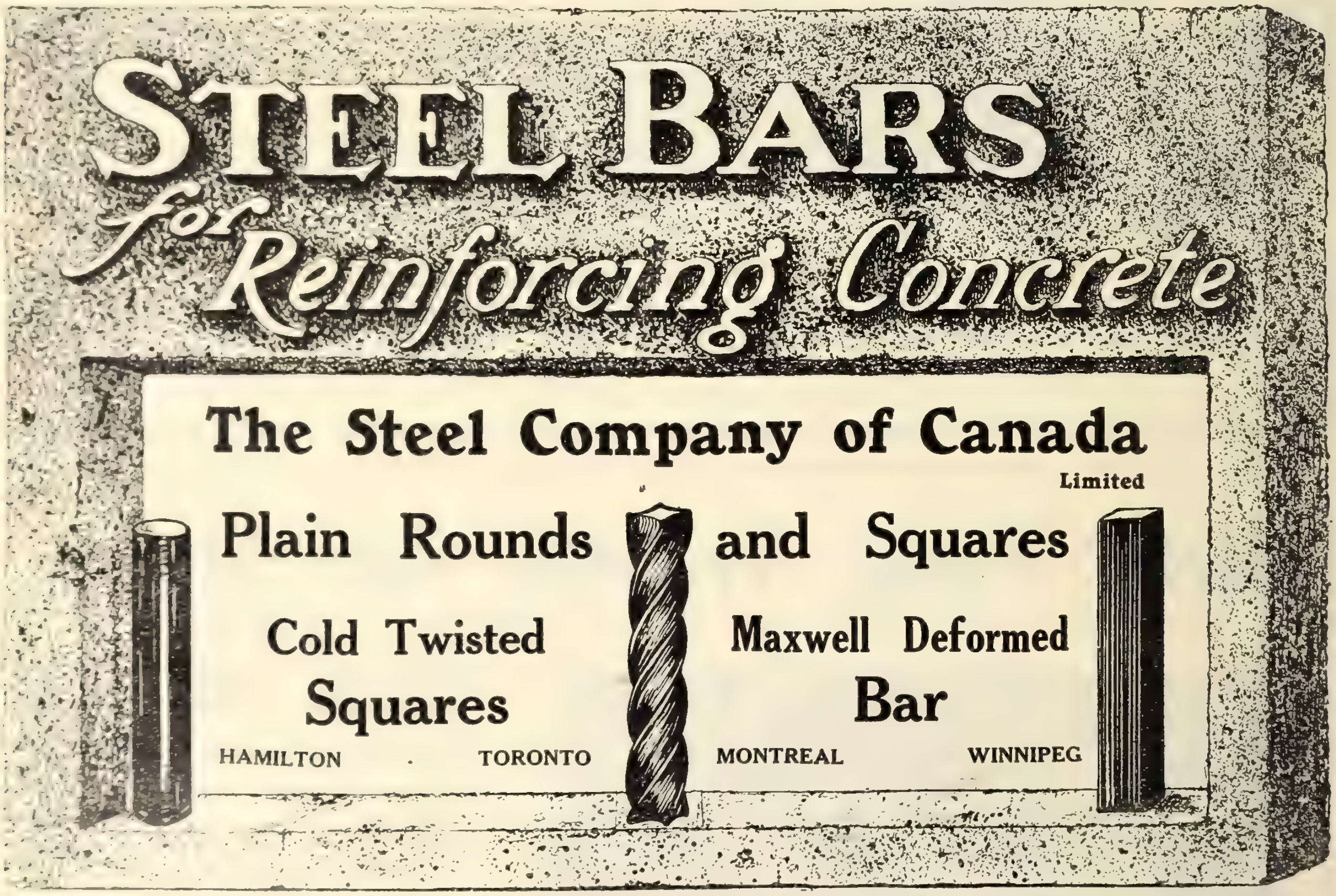

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Plain Rounds and Squares

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Annual Capacity 12,000 Tons

Stock Process for Small Work
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Road Graders, Rock Crushers, Portable Engines, Steam Road Rollers, Sprinklers etc.

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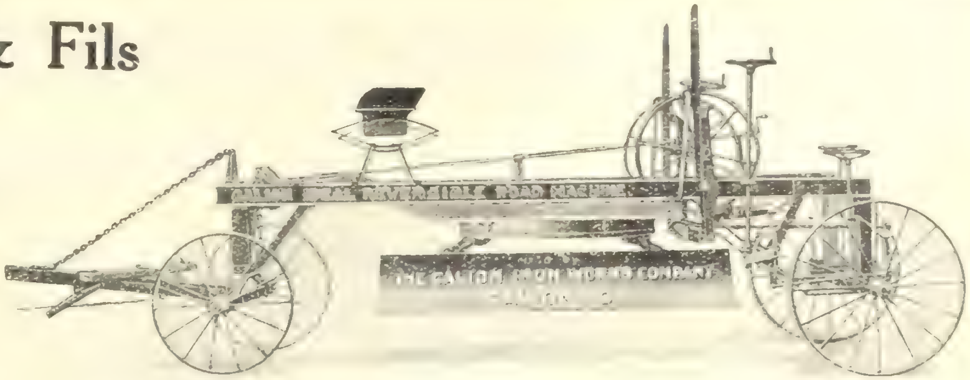
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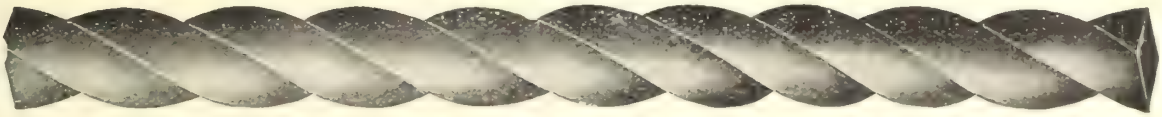

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For Reinforcing Concrete
Plain Rounds Squares
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Cross Arm Braces, Plain and Galvanized.

We can ship from stock

Ask for prices—they will interest you.

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Angles from ¾ x ¾ in. up to 2 x 2 ins.
Round and square from ⅜ in. up to 1¼ ins.
Flats from ¾ in. up to 4 ins. in width, and other special sections.

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Lap Welded Steel Pipe

MADE IN SIZES

12 to 72 inches Diameter

Used extensively for Water Supply for Mines, Mills, Hydraulic Operations and High Pressure Hydro Electric Installations.

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FLEXIBLE COUPLINGS

For High and Low Speeds

Save Power

Reduce
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Smooth Drive

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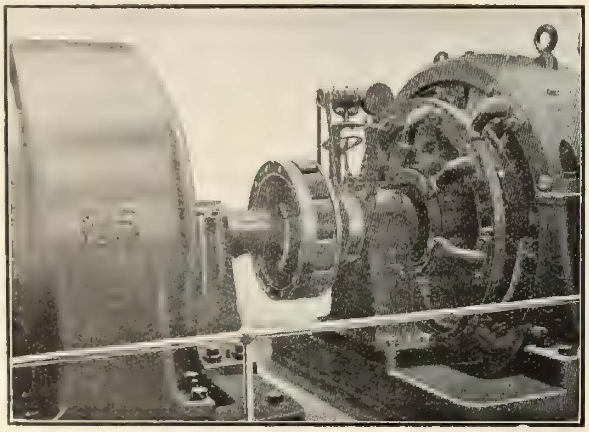

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General Power Transmission

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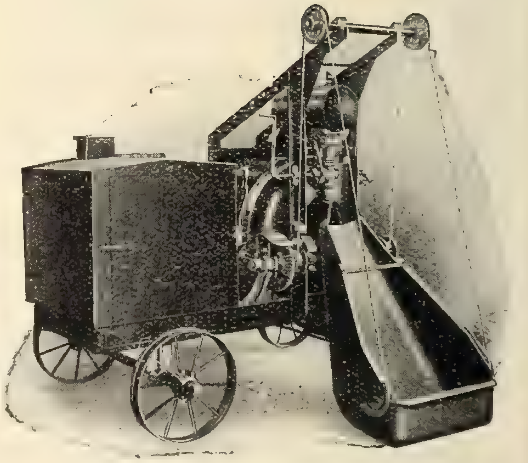
On All Classes of Work KOEHRING MIXERS are mixing their way to popularity because of the Dollar Saving Qualities

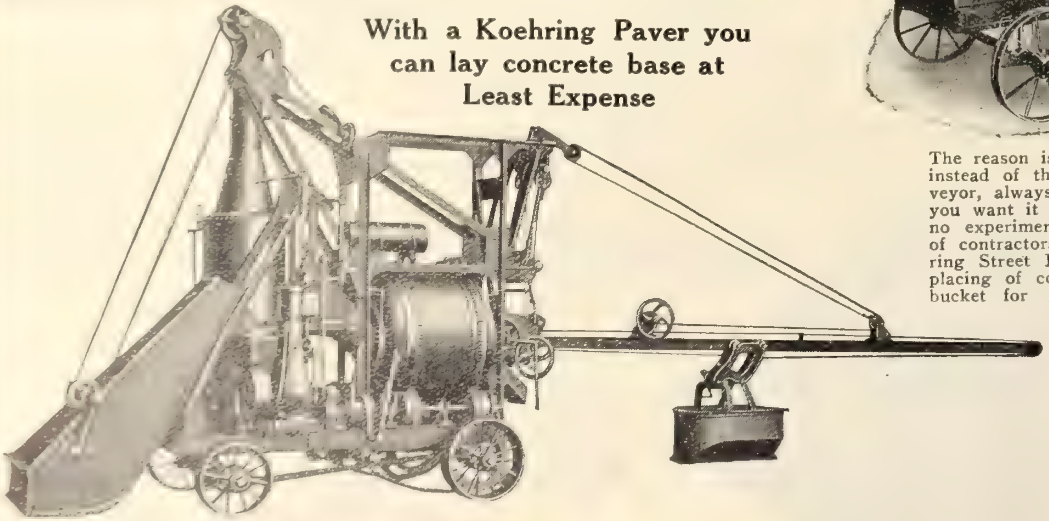
The Koehring 3 in 1 principle of mixing means three times as much mixing or an equal amount of mixing in one-third of the time. There are three independent and opposed mixing actions in the Koehring drum producing thoroughness of mixing and rapidity of mixing and a uniformity of mixing, no other Mixer equals. There are also equally important advantages in the mechanical construction of the Koehring Mixer.

The heavy cast special metal Koehring drum will outlast the drum of any other Mixer. The railroad truck bearing truss and the rollers being keyed on to the axle, makes "wabbly" drums impossible.

The charging bucket raises to a nearly vertical position so that all the material will pass into the drum without pounding the bucket. There are numerous other important features in the Koehring Mixer that you should know about.



With a Koehring Paver you can lay concrete base at Least Expense



The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds contractors' reputations and pays handsome profits. Aren't you interested in this reputation and profit making?

KOEHRING MACHINE CO., Milwaukee, Wis.

Exclusive Sales Agent for Canada: Canada Foundry Co., Limited

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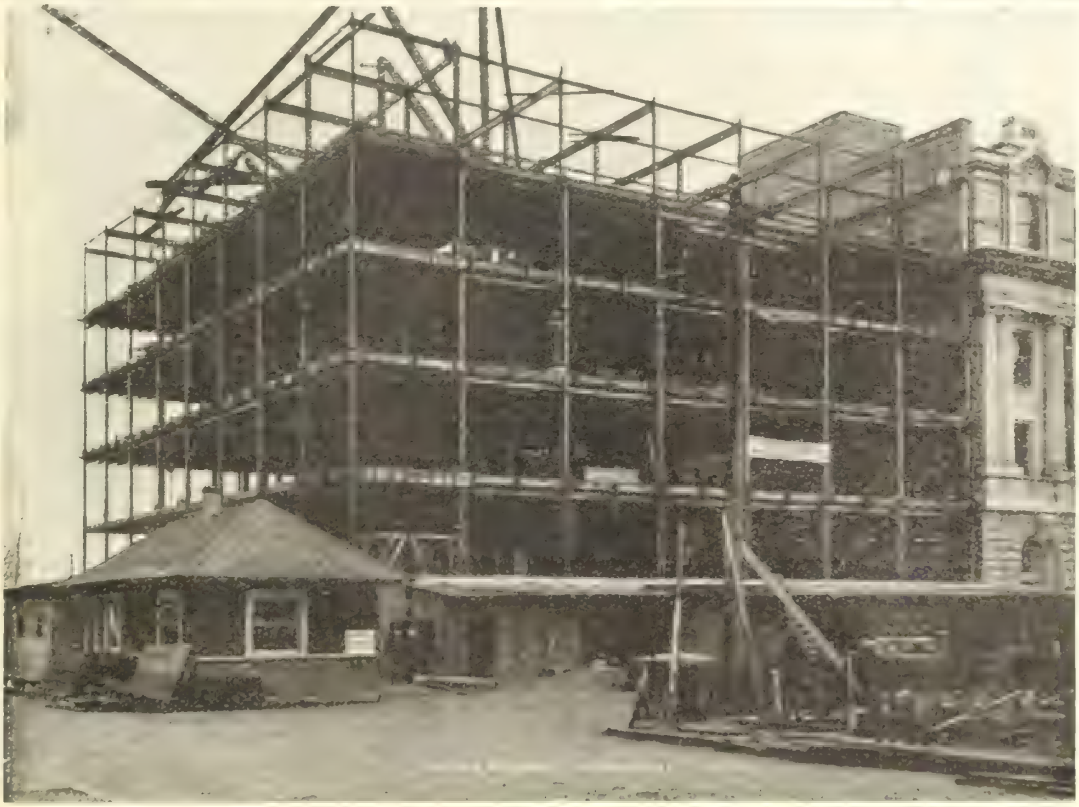
CONCRETE REINFORCEMENT

Due to our increased capacity we can ship carload quantities in ten days to two weeks from receipt order and full details at mill.



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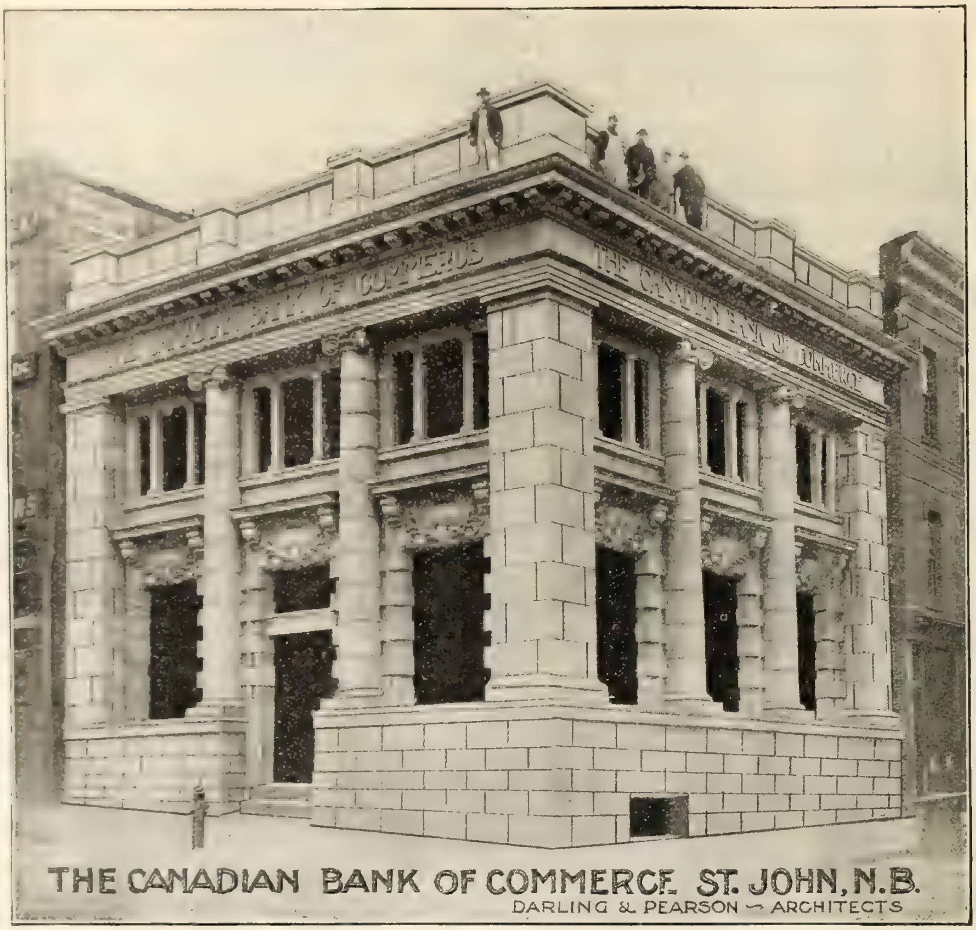

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Roman Stone is of uniform texture and hardens with age—it is the same quality all the way through—no veneer.

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As makers of the high grade "Iron Age" products we solicit your trade in the following lines.

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Each Drag Scraper is pressed from a solid sheet of high-carbon steel—no joints or seams. Our Wheel Scrapers have all the latest dumping attachments and are supplied with either pressed or square bowl. All "Iron Age" Scrapers are of standard capacity.

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Nothing to break, bend, or get out of repair. Ten horses can be used without straining the parts.

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Guess-work in mixer designing is going out. What the construction engineers now insist upon having is the one that continues to deliver 100% efficiency, no matter how strenuous the tests. In the

CHIEF TRADE MARK OSHKOSH MIXER

Speed Quality
Durability Economy

are **all** combined, because it was designed and built by experts trained in engineering and also machinery building. Its Quadruple or Four Way Mix is guaranteed to stand any test. It has fewer parts than any other mixer; consequently no excessive repair bills. In any size demanded; standard or batch hopper or power charger; steam, gasoline or electric power.

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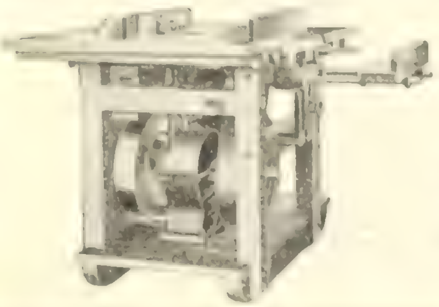

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In our salt glazed vitrified sewer pipe we offer the highest type of sewer material. Pipe of our manufacture have been used in practically every city in Canada. Highly glazed and perfectly vitrified.

If you are contemplating sewer construction we can quote you some attractive prices. We also make all classes of fire clay goods.

Prompt shipment on all orders.

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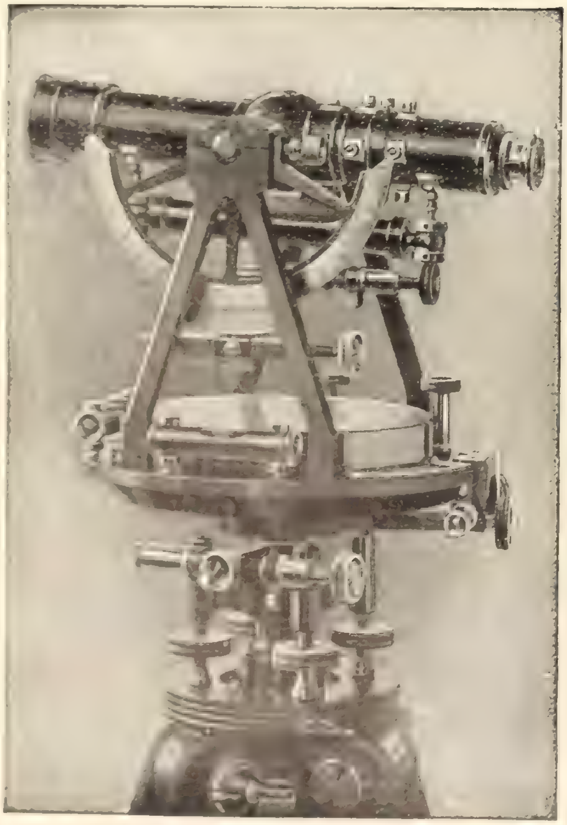
ALSO FIRE CLAY FACTORY AT ST. JOHNS, P. Q.



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Branch Factory : 315 Maritime Building, Seattle, Wash.

Latest edition of Gurley's Manual sent on Application.

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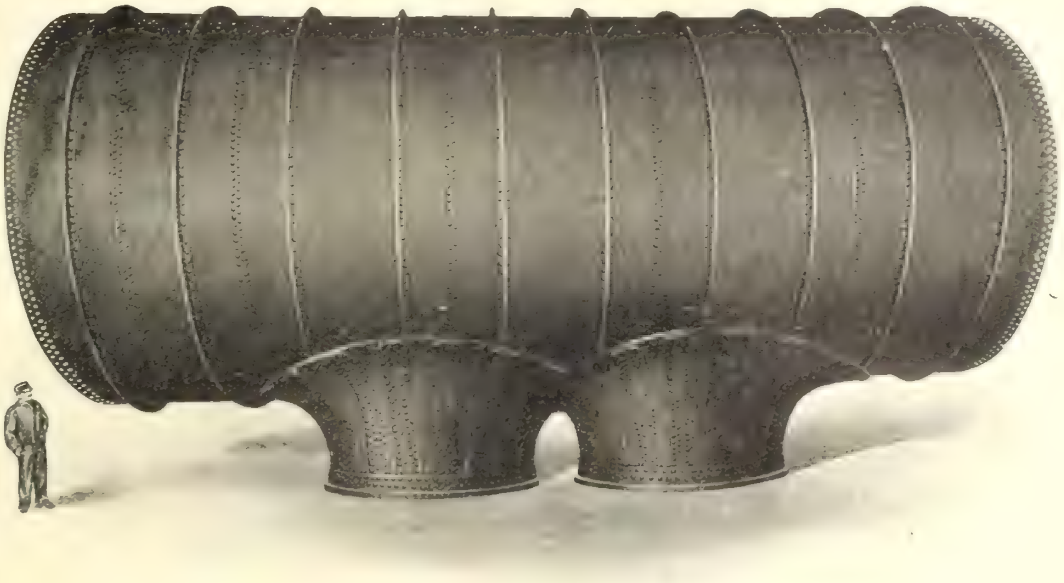

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Wooden Water Pipe

Galvanized Wire Wound and Continuous Stave Pipe for Water Works, Power, Irrigation, etc.

Withstands 250 lb. working pressure.

Not affected by Frost, Corrosion, Electricity or Acid. Water Works Systems installed. Prompt attention to inquiries.

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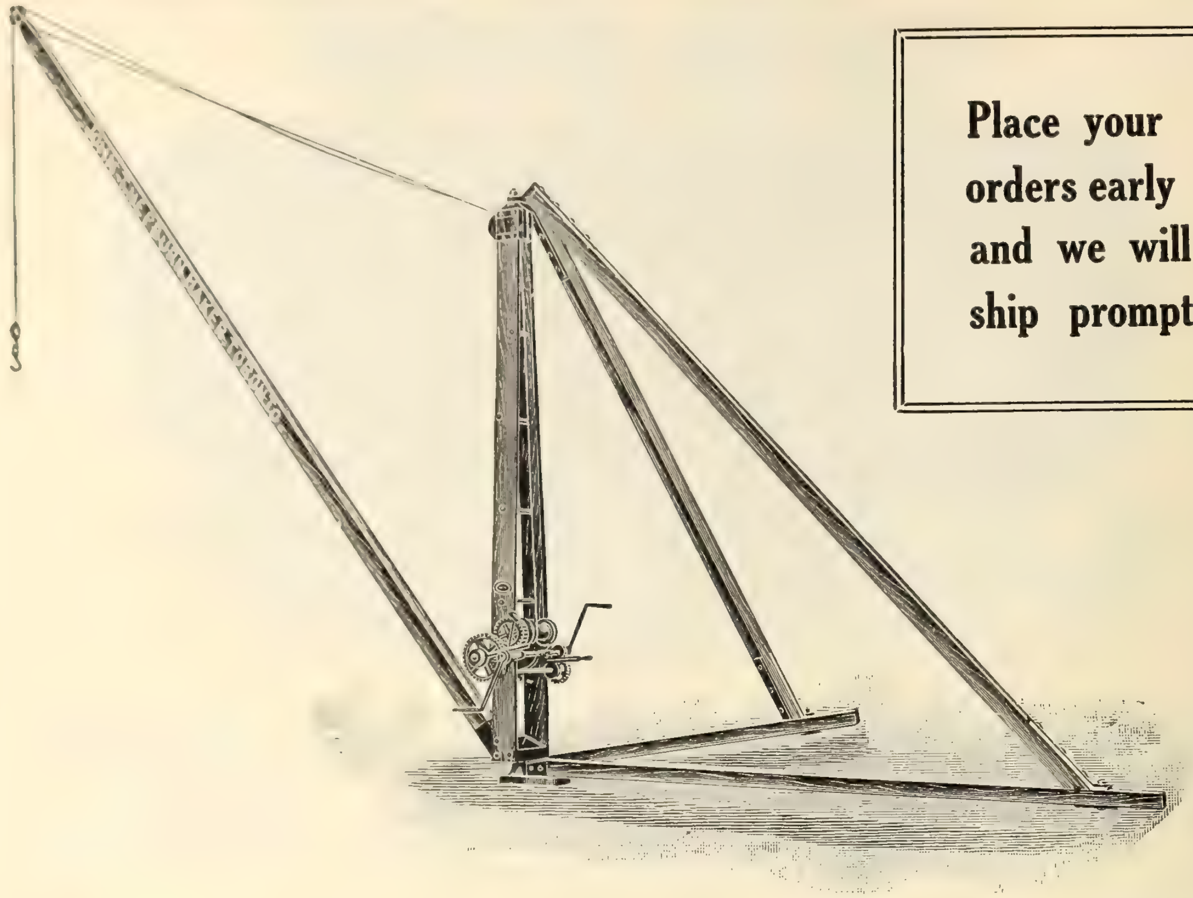

Place your orders early and we will ship promptly.

Handling Material Quickly
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Hepburn Scotch Derricks

These derricks are simply and substantially built and will handle your building materials more quickly than any other derrick. Hepburn Scotch Derricks are correctly proportioned with weight where it is necessary.

Made in standard sizes—one-half ton upwards. Interchangeable parts kept in stock for prompt shipment. Operated by hand or power. Fitted with single and double-purchase gears, band brake, and high-grade wire heaving rope. Interchangeable parts always in stock.

We are also makers of electric and hand overhead Travelling Cranes, Travelling Jib Cranes, Winches, Structural Steel Work, Brick-making Machinery and Iron Castings of every description.

Iron Founder, Crane
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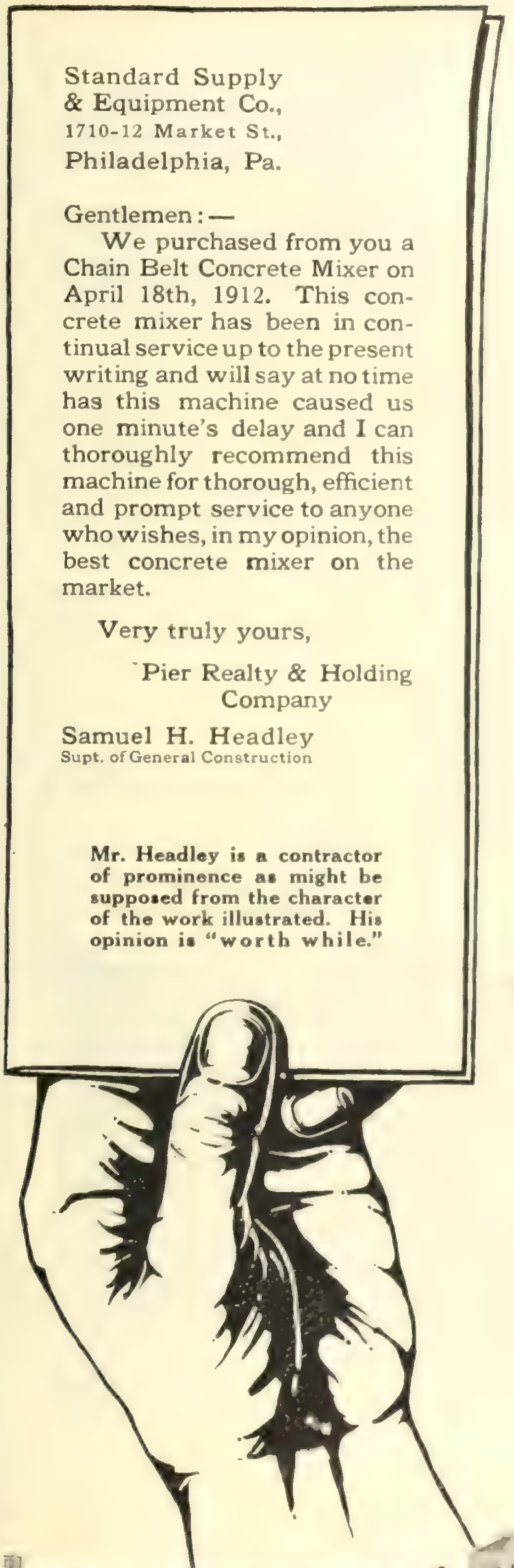

Standard Supply
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Gentlemen: —
We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,
Pier Realty & Holding Company
Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial. Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

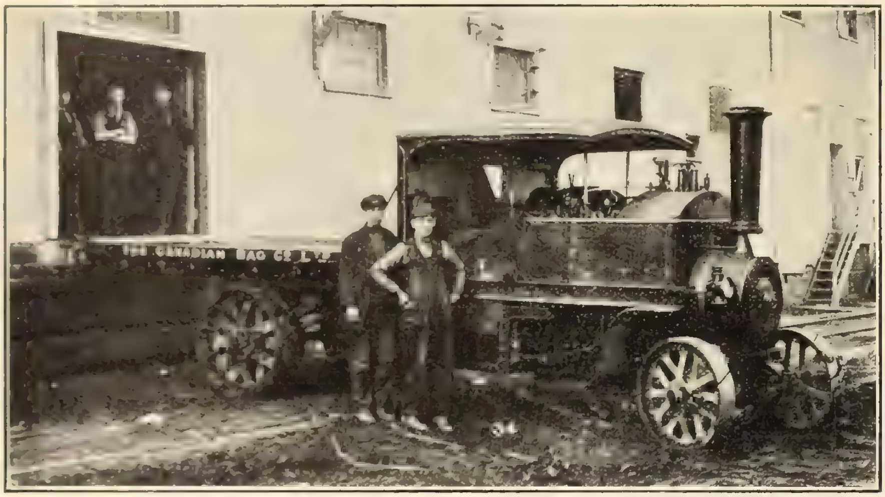
MILWAUKEE, WISCONSIN

Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.

Atlantic City Pier in Course of Construction. Completed, it will have cost [illegible]. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

Foden Patent Steam Truck

The most up-to-date, economical and reliable method of hauling Brick, Sand, Stone, Structural Steel, etc. up hills and over rough roads.



Various types of bodies may be fitted to trucks to suit conditions

"Foden" 6 ton trucks at work in Montreal.

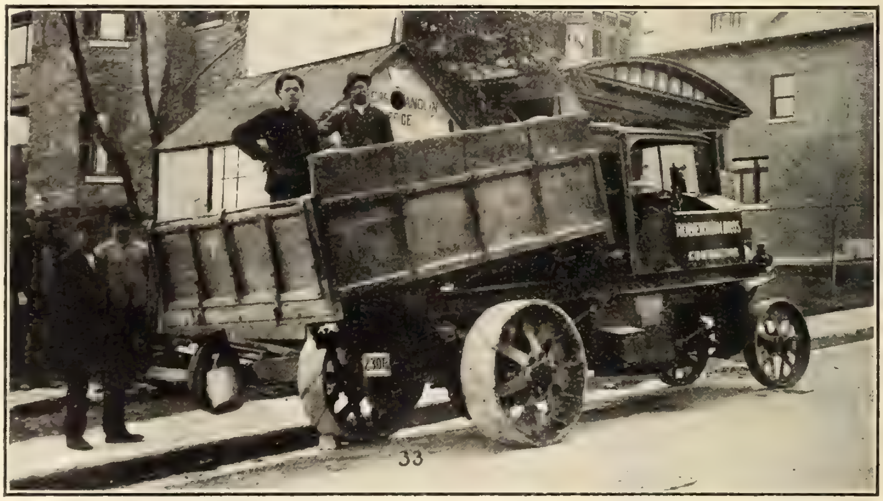
The upper cut illustrates a Lorry type and the lower a Tipper.

Note inexpensive steel tyres 12"-14" face.

20 sold in Canada last year and **21** at present on order including repeat orders.

Independent of gasoline which is soaring in price; dependent only on **Coal or Coke, and Water.**

We stock repair parts.



Unloading face-brick by hand—Box partly dumped. For unloading ordinary brick, stone, sand, etc., box may be fully dumped, mechanically

Fodens Ltd. are the oldest and largest manufacturers of Steam Trucks in the world.

We have Foden Trucks now running in Montreal, Toronto, Winnipeg and Vancouver.

Write for Catalogue and particulars, and to insure Prompt Delivery, Order Early.

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Canadian Agents **Registered Engineers**

Covert Improved Fireplace Damper

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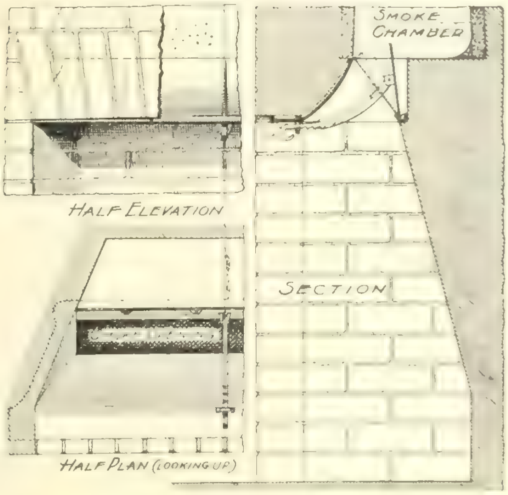

Forms Lintel to Support Brickwork.

Presents Smooth Surfaces to Lead Smoke to Flue.

Simplifies Mason's Work and Saves His Time.

Provides Valve to Regulate Draft and Ventilation.

Simply and Strongly Constructed.

Cannot Get Out of Order.

No Complicated Regulating Gear nor Piercing of Brickwork for Operating same.

Write for "Hints on Fireplace Construction"

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MONTREAL

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DAMP RESISTING PAINT

MANUFACTURED IN CANADA

INSULATES
CHECKS DAMPNESS
BONDS PLASTER TO BRICKWORK
SAVES COST OF FURRING

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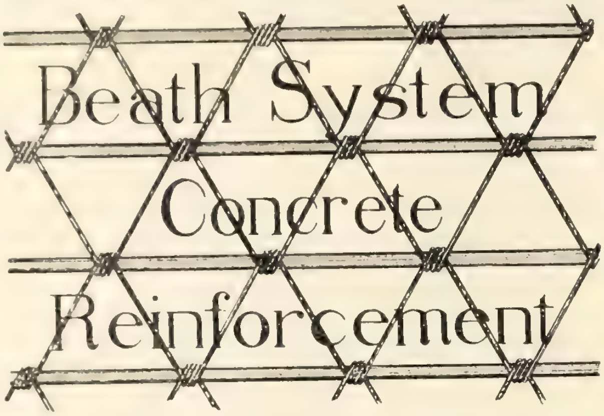
Triangle Mesh

in the

Made of cold drawn mild steel wire, guaranteed tensile strength 90,000 lbs., elastic limit 50,000 lbs. per square inch.

Supplied regularly in rolls 150 ft., 500 ft. and 600 ft. in length, allowing continuous reinforcement over supports. Cut to general length if required.



Main stresses carried on heavy longitudinal or tension members. Diagonal cross wires provided to assist in longitudinal reinforcing and at the same time distribute stresses to main tension members and take care of temperature stresses and strains.

Provides more even distribution of steel reinforcing in every direction.

Tension or carrying members accurately spaced.

Most perfect mechanical bond.

No tying or lapping necessary.

Minimum cost of laying.

Easily handled and stored on the work.

Low cost of inspection.

Absolutely continuous action from end to end in structure.

Higher elastic limits with the same quality of steel due to cold drawing.

Every ounce of steel tested, as it cannot be cold drawn without showing defects, if any.

Diagonal cross wires distribute stresses due to concentrated load over a greater area.

The only design of fabric reinforcement where cross of diagonal wires assists longitudinal or tension members in carrying the load.

Supplied black or galvanized, but black is recommended owing to its better bond in concrete.

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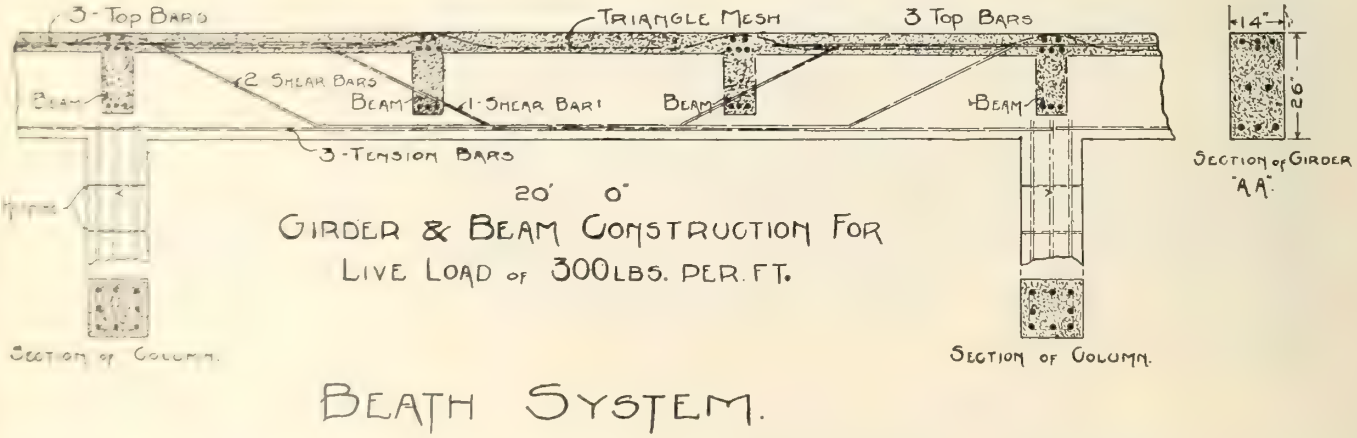

The Beath System Concrete Reinforcement is applicable to any form of concrete construction and offers advantages that cannot be obtained elsewhere. We can show you how to build a fireproof building at the lowest cost possible.

W. D. Beath & Son, Limited

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that you can Afford

to pass us by before getting our prices on your requirements or before putting in your tenders on

Plate Sheet Fancy

or any kind of

Glazing Glass

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We Are Prepared to Undertake Any Waterproofing Problem

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We are in a position to not only supply but also to apply materials for waterproofing residences, business structures, bridges, reservoirs, abutments or any other structure that may be necestary to waterproof, as well as mastic for floors in breweries, abattoirs, factories, reservoirs, etc.

J-M WATERPROOFING MATERIALS

being made of non-organic materials, are practically [illegible]

Our Waterproofing department is composed of men who, through long experience and training, are recognized as experts in their line; and they are under the direction and supervision of one of the best known and most expert waterproofing engineers in the country. The Engineering Department at our nearest branch will gladly co-operate with architects or engineers upon request.

Write for full information

THE CANADIAN
H. W. JOHNS - MANVILLE CO., LIMITED
TORONTO MONTREAL WINNIPEG VANCOUVER

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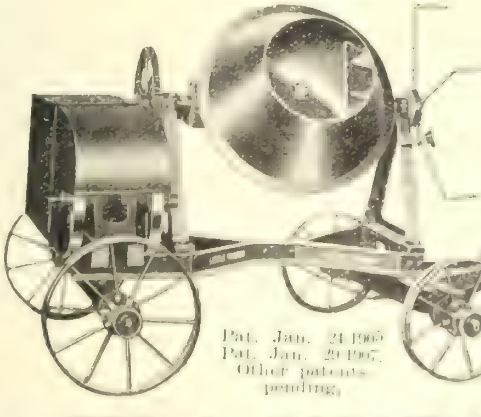

Pat. Jan. 24 1905
Pat. Jan. 29 1907
Other patents pending.

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that needs this mixer if you're wise to profits—the mixer that made big profits for hundreds of contractors in the States last year—that pays for itself in less than 20 days—that is sold under a "Man to Man" proposition of TEN DAYS' FREE TRIAL (and even this yields a profit)—a mixer that does the work of machines for which you'd pay three times the price—that is absolutely unapproached in profit making capacity by any mixer of similar size in the world.

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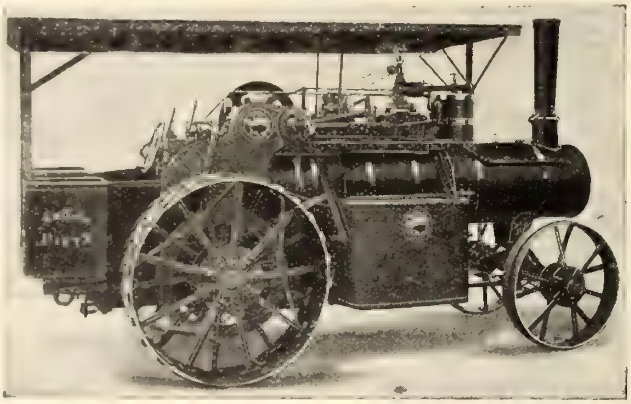

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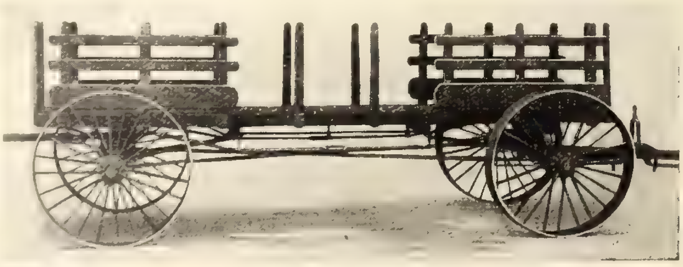

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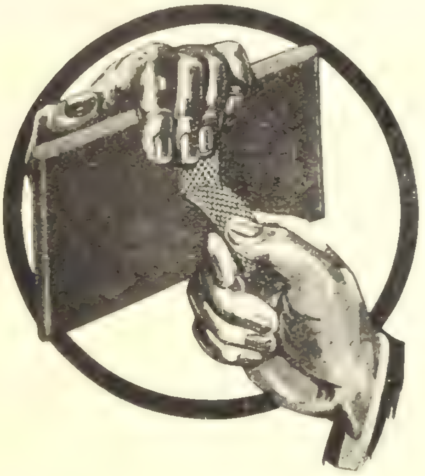
GOODYEAR



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104

GOODYEAR

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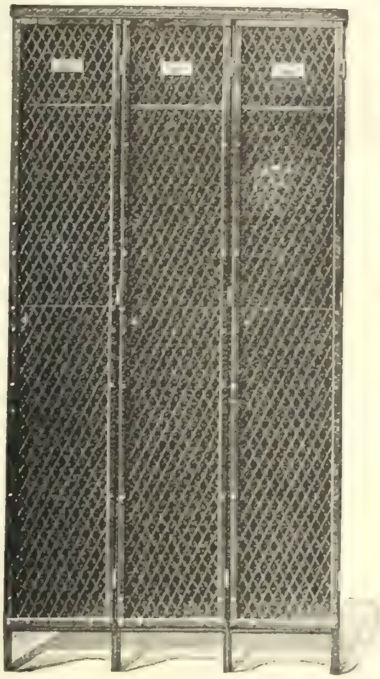

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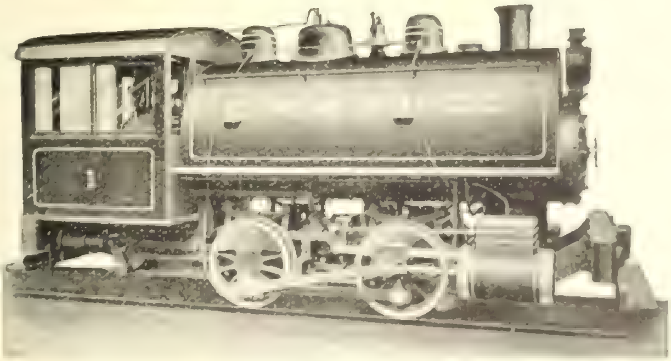

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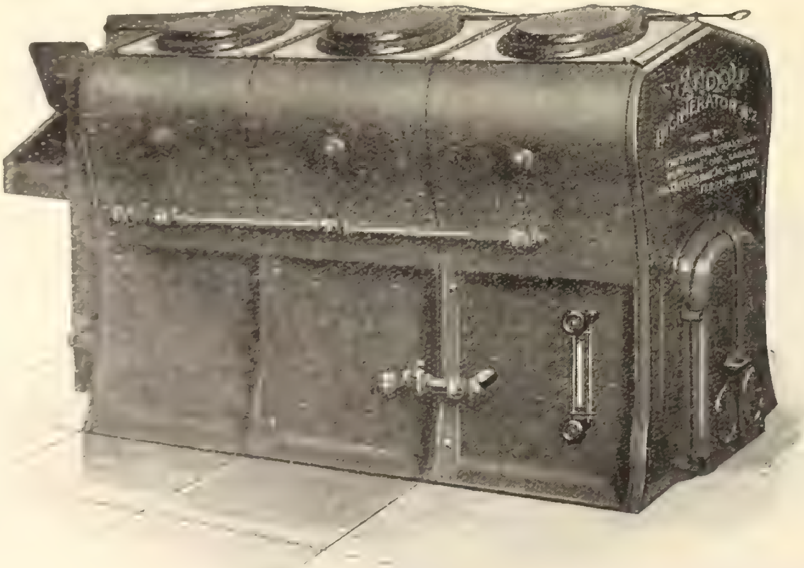

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ESTABLISHED 1886

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Satisfactory Returns of First Quarter

DESPITE the rumors of depression that reach us from across the border and notwithstanding the "tightness" of the money market, there is every reason to feel gratified at the conditions obtaining in the Canadian field. That there is a certain amount of timidity on the part of capitalists concerned with larger ventures cannot be denied, but generally this does not extend to those who are financing the average building operations—although one might be led to the contrary by certain inspired articles of recent date in the western press.

The comparative records that have been compiled to date furnish convincing proofs that so far from there having been any slackening tendency there has been an increase of activity which measures up with Canada's palmiest years. For instance, in the typical field of building operations, Toronto, for 1911, showed an increase per cent. over 1910 of fifteen, and 1912 made a gain of twelve per cent. over 1911, but the first three months of 1913 have recorded a gain of thirty-three per cent. over the corresponding period of 1912. Toronto is not an outstanding example. There is Montreal, where in 1911 there was a decrease of one per cent., in 1912 an increase of thirty-five per cent., and for the first quarter of 1913 an increase of thirty-one. Western reports received to date show great increases in every department of municipal engineering and building work, while it is significant that the great wave of activity has reached the Maritime Provinces at last. St. John, N.B., at least is awakening to the great future that is promised for her in the completion of the great harbour improvements now being carried out at Courtenay Bay. That the impetus has really been given is evidenced in a measure by the fact that the value of building carried out so far this year is considerably more than half the total for Montreal, while the actual increase over its own total for the corresponding period of 1912 is something like two thousand per cent.

The activity in building is only a reflex of activity in municipal, railroad and business circles. It may be asserted safely that 1913 will witness the greatest municipal development in Canadian history, while corresponding enterprise is to be found in public works, good roads and railways. In Western Canada, now that the last contract has been awarded for the G. T. P. and the final completion of this undertaking is in view, there cannot fail to be more and more movement in constructional circles. These brief considerations incline us to the opinion that an aggressive and confident policy is warranted.

It has been urged as evidence of failing activity that the demand for labor is not as keen as at this time last year, but this is readily explained in the amount of work that has been transacted during the winter months and in the absence of incentive to rush out-of-door operations.

Contracts for Public Works

AT the recent annual meeting of the American Society of Engineering Contractors in New York, a report was submitted by Mr. William B. King, of the bar of the Court of Claims of Washington, D.C., chairman of the committee on public construction contracts covering the results of studies with a view to the preparation of a standard form of contract.

The report stated that it had not attempted to complete the study of the subject at this time, but submitted certain statements as a basis for further discussion, as follows:

1. The committee thinks it impossible to submit a complete form to cover all phases of all engineering contracts, but a work of much value can be done by adopting some general principles and formulating them so that they may be made a part of substantially every contract.

2. Every condition, of whatsoever character, by which the parties are to be bound should be submitted to bidders as part of the specifications on which they bid. The contract to be signed should be annexed to the specifications. In this way the bidder is not liable to be surprised by new conditions appearing in the contract submitted for his signature after his bid has been made and accepted.

3. The greatest vice of contracts is uncertainty. In adopting any form of contract or specifications, every effort should be made to secure exactness of definition of the rights and duties of both parties.

4. Recognizing the impossibility of foreseeing every emergency, some authority must be devised for the determination of either unexpected physical conditions or unforeseen ambiguities in the contract.

5. The first requisite to this is promptness, so that the work may proceed. This doubtless requires that all disputed questions shall be primarily settled by the engineer present on the work.

6. While the engineer is the best-fitted person to reach a prompt decision, his relation to the owner unfits him for an impartial decision. There must, therefore, be some provision for an appeal to an impartial tribunal and final settlement of all disputes by it.

7. Disputes should as far as possible be settled

as the contract progresses, so that the parties can know how they stand. To this end all matters of dispute should be reduced promptly to writing and all appeals from the engineer's decisions should be promptly taken.

8. Each party should assume full responsibility for his own share of the contract.

9. This involves the assumption, by the owner, of responsibility for the local conditions and for the borings or other explorations of the site. The contractor should bid on guaranteed local conditions, with an increase or reduction of price for variations from these. The locality belongs to the owner, and the contractor should not be obliged to gamble on it.

10. The principle also requires that a contract should not both provide the exact details of construction and guarantee the result. If the contractor is to do the work according to exact plans furnished him by the owner, the owner should take the responsibility for the result. If the contractor guarantees the result, he should be free to adopt his own methods of construction.

11. The contractor, especially when bound by a time limit, should be given the utmost freedom as to the order and manner of doing the prescribed work.

12. Definite provision should be made for the assertion, in writing, of demands made by either party varying from the normal contract price. The contractor should give prompt notice of a claim for extras and the owner of a claim for a decrease or for the assessment of damages.

13. Some rule should be prescribed for the owner's protection in case of delay on the contractor's part, either by a right to annul the contract or to take over the work, in whole or in part, or to deduct actual or liquidated damages. The subject is one of great difficulty and needs most careful consideration.

14. The contractor should be protected from loss by delay of the owner or the owner's other contractor's, and provision made for settling such losses without suit where possible.

15. What is the proper amount of retained percentages? What should be the maximum part of the contract price to be retained until final payment? Differences of opinion should be adjusted and a minimum rule adopted.

16. Material men insist that the contract bond should provide for payment for materials and labor. This leads to greater security to the material men and consequently lower prices. But it is an unnecessary cost to contractors of established credit. This subject needs the views of both sides.

17. Some contractors and engineers maintain that the contract conditions should be as brief as possible. Your committee believes that all subjects which experience has shown may produce conflict should be definitely disposed of by the provisions fixed in the contract, even if this extends its length.

18. After every effort has been made to avoid all uncertainty in the contract and to settle all disputes as they arise, some honest differences of opinion as to the rights of the parties may persist to the end of the contract. The final settlement of uncontested matters should be made without prejudice to the right of the contractor to recover disputed claims in the courts. It has, unfortunately, become too common to declare that on final payment the contractor shall sign a release of all claims arising out of the contract. This is a one-sided and dishonest provision. When payment is earned by a fulfilment of the contract, it ought not to be denied because the contractor believes that he is entitled to more, nor should he be forced by necessity to waive access to the courts to correct wrongs done him in the course of his contract.

The report further referred to various forms of contract drawn by definite authorities, including the Royal Institute of British Architects and the American Institute of Architects, commending these forms in many respects, but added: "One general remark may be made in regard to nearly all such forms—that they have been generally prepared by persons representing owners, such as architects and engineers, and that, however fair their intention, the inevitable tendency has been to protect the owner's rights at the cost of the contractor's."

Testing a Bridge with Water Loading

A reinforced concrete bridge comprising an arch of 57 ft. span and decking finished with solid parapets was recently tested under the load of 250 lb. per square foot by building a clay wall at each end and filling the tank so farmed with water supplied through a 2½ in. hose pipe. Water can be very easily applied and removed in tests of the kind, and in many cases could be pumped from the river crossed by the bridge to be tested.

Electricity and Reinforced Concrete

The results of tests on the action of stray electric direct currents on reinforced concrete, made at the Technical School at Darmstadt, are given below. In the case of concrete blocks placed in air on a layer of moist sand, or in fresh water, and subjected to the passage of a current of 0.1 ampere at 140 volts, fissures appeared after a period of from fifty to 110 days, the position of the anode; in blocks placed in salt water, fissures appeared at the end of from twenty to seventy days, and the concrete was discoloured near the fissures, first a greenish-grey from ferrous oxide, and, after exposure in the air, brown from ferric oxide. Further experiments led to the conclusion that the fissures were produced by thickening of the iron anode enclosed in the concrete as the result of superficial oxidation. It was also found that the bond of the reinforcement was increased by the action of the current, a result which may be explained by the formation of a layer of oxide, increasing the adhesion between the concrete and the embedded metal.

Domestic Engineering in Ancient Rome

Those who have considered lifts in buildings as appliances of modern origin may be interested to learn that Professor Boni is reported to have made the discovery that three large lifts were in operation at the Imperial Palace on the Palatine Hill in ancient Rome. While lacking the refinements of mechanism and finish characterising modern elevators, the fact that machinery of the kind was employed is worthy of note as an additional proof of the engineering genius of the Romans. As far back as the Ist century Roman houses were warmed by hot air proceeding from furnace rooms and circulating beneath the floors and inside the walls. Again, excavations in Pompeii have brought to light a house fitted with well-designed hot and cold water services, arranged very much the same as those in an essentially modern installation. These and various other examples of ingenuity in early domestic engineering are sufficient to emphasise the point that modern achievements depend mainly upon improved appliances and increased scientific knowledge rather than upon superior intellectual capacity.

Constructional Development of Fredericton, the Capital of New Brunswick

FREDERICTON, the capital of New Brunswick, charmingly situated on a piece of high intervale, on the west bank of the famous St. John River, and one of Eastern Canada's most thriving centres, is to the forefront in municipal development, the city possessing one of the most efficient filtration plants in Canada with other desirable improved equipment. Not only from a municipal standpoint, however, is the "celestial city" attaining prominence, there is extensive railroad and industrial development being carried on, and the bustling thoroughfares indicate that the city is throwing off the lethargy which seems to have been characteristic of the Maritime Provinces, despite the infinite variety of natural resources, their equitable climate, their proximity to the mother country, as well as other manifest advantages. Inaction is being supplanted and Fredericton is taking a prominent part in Eastern Canada's great onward movement of progress.

History tells us that the site of the "celestial city" was once a small Acadian settlement, while formerly it was a favorite camping ground with the Indians. The year 1788 saw the settlement take on a somewhat busier appearance politically, as on July 18th of that year, the third season of the Legislative Assembly of the Province convened in a small building, which is still standing on Queen street. Prior to that the legislators had made the laws and administered the affairs of the province at St. John, but the late Thomas Carleton, who had the honor of being the first governor of New Brunswick, evidently became more impressed with Fredericton, and after two sessions had been held at St. John he decided to locate the capital at Fredericton.

Filtration Plant

Previous to 1906 the city was supplied by pumping direct from the St. John River, and although investigations were made as to the purity of the water, no actual steps were taken until that year. Prof. E. Brydone Jack, associated with Drs. Mason and Shute, proved conclusively that the water supply was contaminated, and recommended that filtration plant be constructed.

Acting on this report the Council called on Mr. F. A. Barbour, consulting engineer, of Boston, Mass., to prepare plans for the plant. Approving of the plans, a contract was let to Messrs. B. Mooney & Sons, St. John, N.B., and the New York Jewell Continental Filtration Company of New York. Messrs. Mooney & Sons constructed the buildings and basins, while the Filtration Company installed the filters and appliances.

The general layout of the plant is as follows: the water is drawn from the river through a 15 in. riveted steel suction, this taking the water from a crib pier 150 yards from the shore conveys it by gravity to a pump well located adjacent to the water works station. From the pump well the water is raised by two 6 in. centrifugal pumps, direct connected to reciprocating engines, with a capacity of 1,400 gallons per minute. These pumps raise the water to the coagulating basin (54 ft. x 22 ft. 3 in.), capacity 90,000 gallons, divided completely into two chambers to allow for the alteration of the period of coagulation to suit the varying conditions of the river. From the coagulating basin the water flows by gravity through the filter (10 ft. x 15 ft.) at the rate of 125 million gallons per acre per day to the clear water reservoir situated below the filter building. This reservoir has a storage of 470,000 gallons.

The coagulating basin, filter tanks and clear water reservoir are constructed of concrete. The supply and effluent are controlled by hydraulic gates, as are also the connections for cleaning filter beds.

The water supply is lifted from the clear water basin and supplied directly to the city by a cross compound Corliss engine, manufactured by Allis-Chalmers-Bullock, Limited, which has a capacity of 3,000 gallons per minute. There is also a Gaskill engine connected to the reservoir for emergencies. Both of these engines are also arranged to pump directly from the river.

Mr. Jno. O'Neill, City Engineer of Fredericton.

Daily tests are made for alkalinity, color, turbidity and the presence of alum. Bacteriological examinations are made twice a week by Mr. H. H. Hagerman, of the Provincial Normal School Staff. Sulphate of aluminum and hypochlorite of lime are the chemicals used in filtration. From 1.50 to 2.00 grains of alum and [illegible] to [illegible] grains of hypochlorite are used to suit the varying conditions of the river. Two cypress tanks, 5 ft. in diameter and 4 ft. deep, are used in mixing the alum, while a concrete tank 2 ft. x 2½ ft. x 4 ft. is used in mixing the lime. Orifice boxes control the flow of chemical. These boxes are located above the basin so that the solution flows by gravity. An efficiency of 98 per cent. is obtained in this plant.

A wash water tank 14 ft. in diameter with a height of 7 ft. 6 in. is situated above the [illegible] room. Capacity, 7,600.6 gallons.

Filter beds are 14 ft. x [illegible] x 30 ft. [illegible] sand

A portion of the operating room, filtration building, Fredericton.

3 ft. The sand is used in four sizes, which is supplied by the New York Continental Jewell Filtration Company.

Strainer System—The central pipe is 6 in. in diameter with twenty-nine branches on each side; 6 in. centre to centre. The strainers are placed 6 in. centres on branches.

Each bed contains 580 strainers, ten on each branch. Each strainer has 32 perforations of which 16 are in the top. Diameter of perforations 3-32 in. Diameter of branches 1 1-12 in. There is a cement filling around strainer system to level of base of individual strainer. Cement was mixed 1-3 for first 4 in. and 1-2 for balance.

Distribution System

The water mains are arranged by what is commonly known as the Gudiron system. The sizes vary from 10 inches to as small as 3 inches. The effective pressure is not as low as would be expected, owing to the fact that the system is regular. An average pressure of 40 pounds is carried increasing to 80 and 90 pounds in times of fire.

The average daily consumption is 627,621 U. S. gallons. A daily per capita consumption of 86 U. S. gallons. During the past three years the installation of meters has been strictly carried out, some step being necessary to prevent this excessive consumption. Up to the present time 218 meters of different sizes and manufacturer have been installed.

The house services are nearly all ⅝ in. service, 9 miles 541 feet are in use at the present time. 108 hydrants of different make are located at different points —the business district being well protected. Nearly all of these hydrants are three way hydrants with 6 in. connection to main. The maintenance of the system is looked after by Superintendent George N. Edney, with an efficient staff of men under him.

Sewerage System

The sewerage system is of the gravity type, and empties into the St. John River at the lower end of the city. The outlet consists of a 14 in. cast iron pipe extending out into the river as far as the channel.

The through main is laid on Brunswick street, consisting of 18 in., 15 in. and 12 in. terra cotta sewer pipe. The rest of the system consists of 10 and 8 in. terra cotta pipe. The manholes are situated about every 300 feet apart. Y's and chimneys are inserted in the system so as to provide for house connections. Up to the present time 821 houses, factories and shops are connected to the system.

In times of freshets, usually in the spring and fall of the year, the sewage has to be pumped into the river. For this purpose a pumping station is located on the bank of the river. Two 6 in. centrifugal pumps run by a motor are used in pumping. Pumping is continued for about 30 to 40 days each year.

Several extensions have been made since the system was first installed, principally for new streets, so that at the present time we have about 12 miles of sewerage system.

Sub-drains were used on several of the streets to take care of the ground water met with. 8 in. to 4 in. terra cotta pipe was used for this purpose, totalling 2¼ miles.

Sewage pumping station, Fredericton.

Permanent Streets

A well defined movement was commenced in 1909 towards the construction of a permanent class of pavements. In that year 4,537.12 square yards of Hassan pavement were laid on Queen and Carleton streets. Concrete curbs and gutters were laid along these blocks at the same time. The cost of the work was divided between the city and the Dominion government. During the same year two blocks of macadam

M. Ryan & Sons' brick and tile plant, Fredericton.

Provincial Normal School, Fredericton.

pavement were laid on King street. Concrete curbs and gutters were placed on these blocks also. 4,387.5 square yards of pavement and 2,577 ft. of curb and gutter were constructed.

University of New Brunswick, Fredericton.

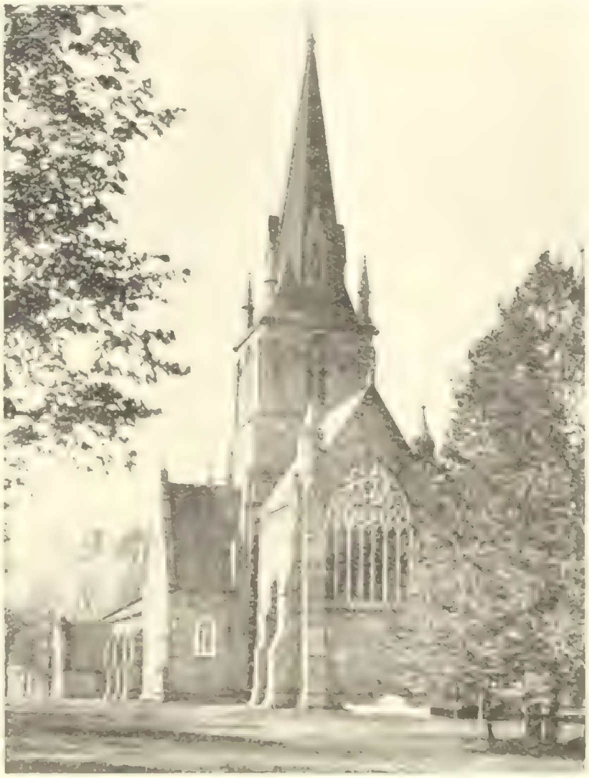
Commencing in the summer of 1910 the city deemed it advisable to lay Tarvia pavements. This step was taken after inspecting the various pavements in the towns and cities of the State of Massachusetts. In 1910, 5,582 square yards of this class of pavement were laid at a cost of $1.04 ½ per square yard. In 1911, 5,650 square yards were laid at a cost of $1.04 per square yard; 4,160 square yards were constructed at a cost of $1.02 per square yard in 1912. The same method of construction was used during the three years.

Engineering Building at the U. of N. B.

The road bed was shaped to cross section by excavating, filling and thoroughly rolling with a 15-ton steam roller. On this surface was spread crushed trap rock to a depth of 6 inches. The stone used being 1½ to 2 in. This course was thoroughly rolled until smooth and firm, then a thin layer of sand was spread evenly over this course.

Tarvia X, heated to a temperature of 300 degrees Fahrenheit was then spread over the surface to the amount of 1¼ gallons to the square yard.

A wearing course of fine stone was then spread to a depth of 2½ inches and thoroughly compacted by rolling.



Christ Church Cathedral, Fredericton, one of the architectural treasures of the province.

Tarvia X heated to 300 degrees Fahrenheit was spread evenly over this surface to the amount of 1½ gallons to the square yard.

A thin layer of sand was then spread over surface and rolled, and street opened to traffic.

This class of pavement is giving good satisfaction in this city. No apparent wearing can be observed, except around manholes and at the edges.

Ordinary Street Work

Each year additional sidewalks are constructed. This construction consists of the ordinary asphalt sidewalks. The city now has about 40 miles of this class of work in use.

Catch basins are located at various points in the construction of concrete curbs and gutters, while masonry wells are built at the intersection of streets leading to permanent outlets. [illegible] concrete catch basins and 200 masonry ones were constructed up to the present time.

Wooden sewers are being replaced by terra cotta, so that in a few years every street will have effective drainage. Truck sewers are installed on the streets running to the river, so that each river street drains half of the block located on either side of it. About 5 miles of this class of work has been completed. Sizes varying from 20 in., 15 in. to 8 in. salt glazed sewer pipe are used for this work.

The Importance of Water Waste Investigations in the Smaller Cities and Towns

During recent years much space has been given in technical papers to discussions of water waste surveys and prevention. Practically all of the literature on the subject relates to water waste in the larger cities and in considering the enormous waste of water in such cities as Chicago, the importance of waste curtailment in small cities and villages has been very generally overlooked. We here give an abstract of the paper read before the Illinois Water Supply Association by W. D. Gerber, consulting engineer, Chicago, which relates primarily to the water waste problem in the smaller municipalities.

The curtailment of water waste is particularly desirable in cities which secure their water supplies from deep or artesian wells. The continual draft on the wells has lowered the ground water level to such an extent that serious problems are presented in getting the water to the surface. With a less severe demand on such wells we may reasonably expect their life to be materially lengthened.

Those cities which draw their supply from rivers or other surface waters, must of course treat such water to render it suitable for domestic purposes. These treatment plants, besides the treatment tanks and filters, usually have connected therewith large clear water reservoirs for the storage of a considerable quantity of the treated water. The capacity of the treatment plant, including the reservoir, is usually designed upon the consumption, and the consumption is usually taken as a factor of the total daily displacement of the pump plungers. If a large percentage of the pumpage is waste, we can readily see that the works will be designed too large for the immediate needs of the community, and with a consequent expenditure of funds that in many cities can be ill afforded.

Unnecessary Pumping

In the design, then, of new equipment, and, subsequently, if the station is to be operated on an efficient and economical basis, and the supply conserved, all unnecessary pumping should be eliminated.

The causes of this unnecessary pumping or water waste can usually be grouped under five heads: Pump slip, underground leakage, defective plumbing, carelessness, or willful waste and surreptitious connections.

Pump slip is the difference between the volume of the plunger displacement and the volume of water actually discharged for any given period of time, and is usually expressed in percentage or as the ratio of this difference to the plunger displacement. It is caused either by leakage past the plunger or by defective valve operation in the water chambers, the latter being the more common cause, though badly worn pistons or plungers are common enough.

With pumps of the direct acting or non-flywheel type, there is frequent complaint that the pumps pound, and several arrangements have been supplied to produce more of a cushion at the end of the stroke. This cushioning has the effect of shortening the stroke and of course thus reducing the volume of pumpage. The pump counter, however, goes on counting the number of revolutions, and the daily report card shows so many revolutions at full capacity as the volume of water pumped.

Pump slip is not, properly speaking, a water waste, but is rather a waste of pumping effort, and should be kept as low as is practical. Just where this practical limit is we do not know exactly, but undoubtedly the same limit would not apply to all cities or to all types of pumps. About all we can say is that the practical limit is the point where the value of the water gained through close-fitting plunger and valves would be less than the value of the additional power required to overcome the added friction due to the tight packing. However, an allowable slip of 3 to 5 per cent. does not seem to be out of line with good operation and practice.

The detection of underground leakage is a very different matter than that of discovering and measuring pump slip. The distribution mains are covered up and we can only guess at what has taken place by a detail study of the pumping chart. The demand or consumption for a few hours after midnight, say from 12 to 4 o'clock, is frequently indicative of the tightness of the system. At this time of the day the consumption is or should be at its minimum, while if the relative demand is high it is an indication that something is wrong.

There is always some leakage from the mains that cannot be checked, and it is usual to allow a loss of 2,000 gals. per mile of 12-in. pipe, while for sizes other than 12 ins., the allowable loss is taken in the same proportion as the ratio of the diameters. One drop a second is not much of a leakage, and yet one drop a second from every joint in a mile of pipe would amount to approximately 1,400 gals. in 24 hours.

Many men employed in the Water Department of our cities will tell you that wherever there is a leak it will show very quickly at the surface. They argue that every leak they have had to repair has been found through the surface indication, hence it is so for every leak. Such men may be surprised to know that leaks discharging from 50 gals. to 2,500,000 gals per day have been discovered when there was absolutely no surface indication, and the location of such losses was a complete surprise to those most interested.

When the volume of consumption is abnormally high, there is reason to suspect that there are unaccounted for losses, and the best way to satisfy oneself on the matter is to have a water waste survey made.

Interesting Examples

As an instance of what such a survey may accomplish, I wish to cite the results obtained in a city of some 3,500 people, in which the water works is owned by a private corporation. For some years the pumpage had been excessively large. Repeated appeals to the consumers to be more careful brought no apparent relief, and finally an additional source of supply was developed entailing an expenditure of $10,000. This increased the available amount of water, but the volume of the pumpage in no way diminished, but rather increased. During April and the early part of May of last year the average daily pumpage varied from 680,000 to 700,000 gals. per 24 hours. A water waste survey located a blown-out lead joint in an 8-in. main wasting more than 300,000 gals. per day. This leak occurred under a broken stone-filled roadway, and behind a stone arch bridge at a point where the pipe was 14 ft. below the street surface. The water was finding a ready outlet into the creek. Had this waste been discovered and stopped prior to the development of the new supply, the company would have been $10,000 better off in cash, and would have felt much easier in regard to the adequacy of their supply.

Another instance is a city of 2,000 population. The city operates a motor-driven 400,000-gal. triplex pump. From October, 1911, to June, 1912, it was necessary to operate the pump practically all the time to keep up the pressure, and even at that it seemed impossible to fill a 100-ft. standpipe more than half full. A water waste survey was made and a 4-in. pipe was found cracked squarely in two, permitting a leakage of 200,000 gals. per day, which found a ready outlet in an abandoned 12-in. tile storm water sewer, which crossed directly over the crack about 8 in. above the water main. There was no indication at the street surface of any such leak, though the pipe was laid but 4 ft. deep, in fact the ground was not wet 2 ft. away from the break. Incidentally I might add that the pump slippage was 25 per cent. leaving a consumption of about 100,00 gals. or 50 gals. per capita per day.

Making Surveys

The method of making these surveys was substantially the same in both cases. At a point near the standpipe, an opening was made in the ground down to the main, and a 1-in. corporation tap was placed in the pipe in the usual way. A pitometer, which is a portable recording meter, was set up at this point, and a measurement of the flow during the night when the station was shut down was made. The city was then divided off into a number of districts, and during the day all the valves on the boundary line of the districts were closed, except one, which was left open to supply water to the district. That night after one o'clock this last valve in each district was closed, and the time when the valve went down was recorded. The rule was to begin at the outlying district and work toward the instrument. As each district was closed off from the supply the valves between it and the foregoing district were opened, so that when the night work was finished all the valves would be left open.

A comparison of the time each district was closed down, with the chart from the instrument, disclosed the district in which the loss occurred, for the minute the valve went down, which cut off the leak, the instrument recorded a drop in the rate of flow from the stand-pipe.

With the location of the loss in any particular district, it is generally a comparatively simple matter to locate the point of leakage by using an Aquaphone on the fire hydrants and sill cocks of the residences. Sometimes, however, the final location of the leakage is not so simple, and it is necessary to make a subdivision of the district, in this way usually the suspected territory may be reduced to a few blocks at the most.

The subdivision of a district into its smallest units is usually the method required when the losses are from defective plumbing, and in addition it is necessary to make a house to house inspection of the entire plumbing in each building. Carelessness in making proper plumbing repairs seems to be more prevalent in cities where the water is sold at a flat rate, the installation of meters having a wholesome effect on this class of consumers.

Carelessness as to fixture waste and willful or deliberate waste are like defective plumbing, confined largely to the systems supplying water at flat rates. The sentiment seems to exist that so long as one is paying so much, what is the use of being careful. "We are entitled to all we can get out of the fixtures." This sentiment really reacts against the consumers, for with everyone in the same frame of mind the system becomes virtually a sieve, and of course the pressure is always low, especially in territory some distance from the pumping station. It all comes home to him in case of fire and no pressure.

Where such conditions exist it is sometimes a tedious task to locate and correct such losses, and the only way it can be done successfully is by a minute subdivision of the district, and night tests in the curb cock, together with daylight inspection of the individual premises. The returns in the value of the water saved usually far exceed the cost of doing the work.

Surreptitious or uncharted connections may occur almost anywhere, though they seem to be more frequent in the manufacturing districts of the larger cities. The making of a connection to a city water main by a private person or corporation is, of course, a deliberate intent to get something for nothing. Very frequently such connections are made from the fire service lines, which are extended into the grounds of the individual or company.

Where a survey indicates that there are surreptitious connections, the only way of definitely locating them is to segregate the suspected plant and measure the total amount of water going into the same. This, together with a very careful inspection of the fire lines and legitimate services, will usually produce a solution of the problem. It is needless to mention, however, that such work must be quietly and carefully done that correct results may be obtained.

It is a very unpleasant charge to make, but nevertheless it is true that in many of our cities and villages no record is kept of the location of the house service, and when the top of the curb box get broken off or covered up, the service is "lost," and in case of repair or an order to shut off the service much time is lost in looking for the old box. In such cases the exact location of the service pipe can be quickly located by the use of a small electrical instrument called "A lead-pipe finder," and with the line of the service located in the ground, the shut-off box can be quite easily located by the use of a miner's compass, or as it is frequently called, a dip needle.

The latter instrument also comes in quite handy in locating street valves on the mains in unpaved streets where the boxes have been covered up by a road grader in crowning or shaping the surface of the street.—Engineering & Contracting.

Disposing of the city's refuse cost the city of Milwaukee $2.40 per ton for operating the [illegible] incinerator and $2.43 per ton for collecting the refuse. At these prices 19,138 tons were disposed of during the past year.

A Scientific Cost-Keeping System for Reinforced Concrete

By John S. Nichol*

More and more reinforced concrete work is being executed on the percentage basis, and it behoves the owner to be acquainted with proper methods of keeping concrete costs. Reinforced-concrete contractors, and in fact most contractors, have jealously guarded giving out details of their cost-keeping systems. In many cases this is undoubtedly due to the lack of proper cost-keeping systems, for it is surprising how few contractors know their real unit costs. It has been said that the large mortality amongst the reinforced-concrete construction companies has been caused by their ignorance of costs.

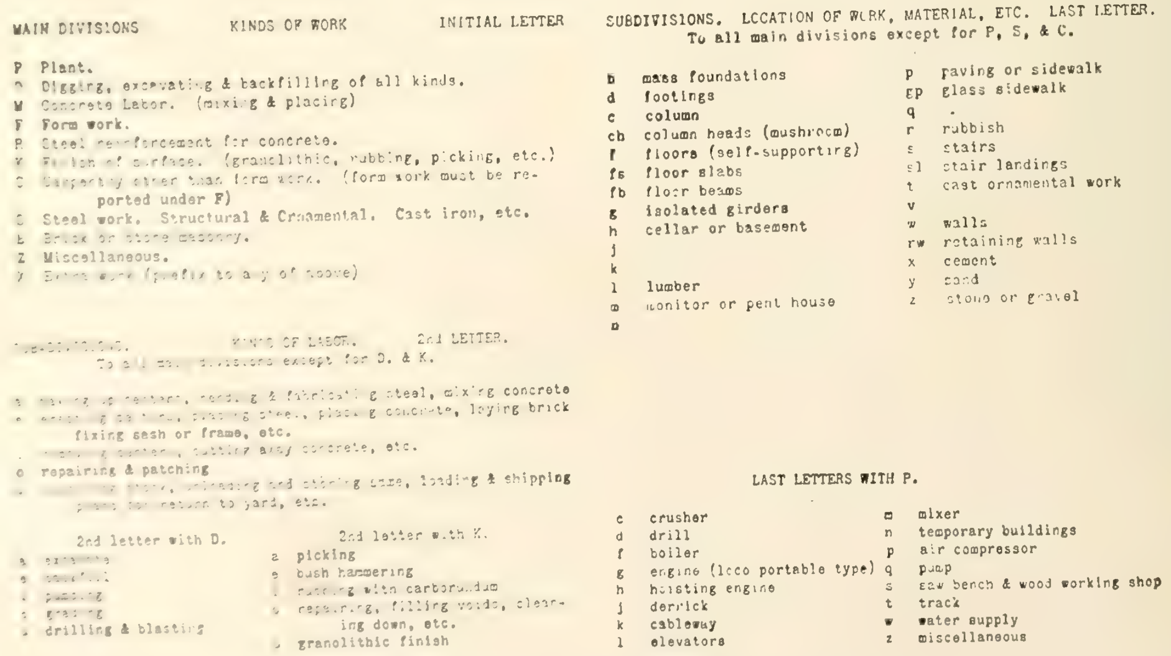
The owner who employs a building organization which has a proper cost-keeping system is in a much better position to secure the highest value for each dollar of investment than if the building concern does not know its daily unit costs. Therefore, this detailed explanation of the reinforced-concrete cost-keeping system of the Aberthaw Construction Company of Boston should be of value to prospective builders, as well as to contractors at large, for the same general principles are applicable to practically all building work.

The fundamental requirement of a contractor's cost-keeping system is to give quickly the actual unit costs of various kinds of work from day to day or week to week. If it does not, scrutiny of costs becomes nothing more or less than a post mortem. A general knowledge that the cost of work is running high is useless unless the particular items which are too high can be picked out quickly so that a remedy may be made immediately. With a knowledge of the cost items that are excessive, it is a comparatively easy task to rearrange the work so that the cost goes back to the proper basis.

From the contractor's point of view it is absolutely essential to know daily what is being accomplished on each job and the cost of the work performed. The matter must be put before him quickly and briefly so that he can recognize at once any high costs on any part of the work. He must be able to discover any variation in the mixes of the concrete from those specified, and know whether the construction is making the progress necessary for completion at the specified date.

Principle of a Unit-Cost System

In construction work, for every division of time, whether a day or a week, certain units of work have been performed, so many cubic yards of concrete have been placed by a certain number of men who receive a definite number of dollars for their work, so many pounds of steel reinforcement have been placed by a certain number of workmen for a known expenditure, a certain number of floor forms and column forms have been erected at a given expenditure for labor. If the amounts spent in the various kinds of work are reported separately, a division by the number of units



MAIN DIVISIONS KINDS OF WORK INITIAL LETTER

P Plant.
D Digging, excavating & backfilling of all kinds.
M Concrete Labor. (mixing & placing)
F Form work.
R Steel reinforcement for concrete.
K Finish of surface. (granolithic, rubbing, picking, etc.)
C Carpentry other than form work. (form work must be reported under F)
S Steel work. Structural & Ornamental. Cast iron, etc.
B Brick or stone masonry.
Z Miscellaneous.
Y Extra work (prefix to any of above)

SUBDIVISIONS. KINDS OF LABOR. 2nd LETTER.
To all main divisions except for D. & K.

a making up centers, bending & fabricating steel, mixing concrete
e erecting centers, placing steel, placing concrete, laying brick fixing sash or frame, etc.
i removing centers, cutting away concrete, etc.
o repairing & patching
u handling in store, unloading and storing same, loading & shipping plant for return to yard, etc.

2nd letter with D.

a excavate
e backfill
i pumping
o grading
u drilling & blasting

2nd letter with K.

a picking
e bush hammering
i rubbing with carborundum
o repairing, filling voids, cleaning down, etc.
u granolithic finish

SUBDIVISIONS. LOCATION OF WORK, MATERIAL, ETC. LAST LETTER.
To all main divisions except for P, S, & C.

b mass foundations
d footings
c column
cb column heads (mushroom)
f floors (self-supporting)
fs floor slabs
fb floor beams
g isolated girders
h cellar or basement
j
k
l lumber
m monitor or pent house
n
p paving or sidewalk
gp glass sidewalk
q .
r rubbish
s stairs
sl stair landings
t cast ornamental work
v
w walls
rw retaining walls
x cement
y sand
z stone or gravel

LAST LETTERS WITH P.

c crusher
d drill
f boiler
g engine (loco portable type)
h hoisting engine
j derrick
k cableway
l elevators
m mixer
n temporary buildings
p air compressor
q pump
s saw bench & wood working shop
t track
w water supply
z miscellaneous

Four Cards Illustrating the Mnemonic System

The originals, typewritten on white cards 4 by 6 inches, may be filed by perforation in the upper right corner.

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* In The Engineering Magazine.

of work done gives, of course, the unit costs. If, after such a list of unit costs is made up, there is a large unclassified amount left over about which there is no clue as to what it represents, it is quite evident that there has been waste or mismanagement somewhere and the work has not been properly systematized.

Cost-Keeping Department Separate from Book-Keeping Department

The cost-keeping department of the Aberthaw Construction Company is entirely separate from the book-keeping department, but both are located at the home offices of the company at Boston. This company believes that the same man who keeps the books should not keep concrete costs, as his view point is entirely different from that which is necessary for this work. A book-keeper does not appreciate the importance of unit costs, and is apt to look to the total amount of money chargeable to the operation rather than to the unit costs of the component parts of such operation. A book-keeper is not concerned whether construction work is extravagant or economical.

The cost-keeping department of the Aberthaw Construction Company devotes its entire time to keeping costs and is not concerned with any other phase of the work. At the same time, it is very familiar with the work which is being done on a given job and is able to discern where reports from the work are probably not correct. It thus acts as a check on the men on the job. By means of a very ingenious number of forms, and a mnemonic code system for reporting the various kinds of work and the material used for certain work, the cost-keeping department works quickly and efficiently.

Mnemonic System

The Aberthaw Construction Company use a unique mnemonic code system for reporting work done in the field, not because of their wish to keep the cost of the work secret but because they wish to report work in the cheapest and quickest way. They realize that unless a time-keeper is given a definite way of reporting work quickly, he will invent a system of his own or else his descriptions of the work done will be incomplete and not intelligible. By the establishment of a standard code, each job is able to report accurately and quickly the labor and material put into the various kinds of concrete work.

In this mnemonic system symbols of three or four letters represent the exact kinds of work done. The main divisions of the different kinds of work are indicated by the initial letter of the symbol, while the second letter represents the subdivisions of the different kinds of labor. The last letter represents the location of work, material, etc. For instance, concrete labor (mixing and placing) is always represented by the initial letter "M," (masonry) form work by the letter "F," reinforcement by the letter "R," digging and excavating and back filling of all kinds by the initial letter "D." The second letters represent the various kinds of labor. For instance, "a" stands for making or preparing anything before erection, such as making up centers, bending and fabricating steel, mixing concrete; "e" stands for erecting or placing, for example as erecting centers, placing steel, placing concrete, laying brick, fixing sash or forms, etc.; "i" signifies removing anything, such as centers, cutting away concrete, etc. The last letters, which signify location of material, work, etc., have meanings such as the following: "c" columns, "f" floors (self-supporting), "w" walls. By referring to the reproductions of the standard cards herewith this matter will be made more clear.

In some of the cost-keeping sheets shown here a combination of these letters will be found. For instance, take the symbol "Maf" which stands for mixing concrete for floors." "M" is the initial letter for "concrete labor" (mixing and placing); "a" is the second letter having for one of its meanings "mixing"; "f" the last letter refers to "floors." Likewise "Fef" would indicate "erecting centering for floors," "F" being the initial letter for "form work," "e" for erecting, and "f" for floors. In a similar manner "Ref" would signify placing steel reinforcement in floors—"R" being the initial letter for steel reinforcement, "e" meaning "placing"; and "f" referring to "floors."

It is surprising how familiar all of the time-keepers are with the meaning of these symbols, and it is unnecessary for them to refer to the cards in order to make up one of the generally used symbols. Of course, where certain work of an unusual character occurs they would have to refer to the code mnemonic cards and make up the proper symbol. The use of the symbols allows the cost-keeping sheets to be of comparatively small size with narrow columns.

Time-Keeping

On ordinary contracts, one time-keeper is sufficient to secure all of the data necessary to fill in the Time-keeper's Field Sheet, the Daily Time Sheet, and the Pay-Roll Sheet. Where the pay roll on a job exceeds two thousand dollars per week it is necessary to employ two men, one to make the rounds, securing the time, and the other to prepare the sheets. On smaller jobs one man can perform both duties.

The time keeper makes at least four rounds on the work each day taking with him the Time-keeper's Field Sheet mounted on cardboard so as to facilitate the writing. Before leaving the office he writes in the

Reduced Fac Simile of Pay Roll Sheet. [illegible] inches. White

[illegible]

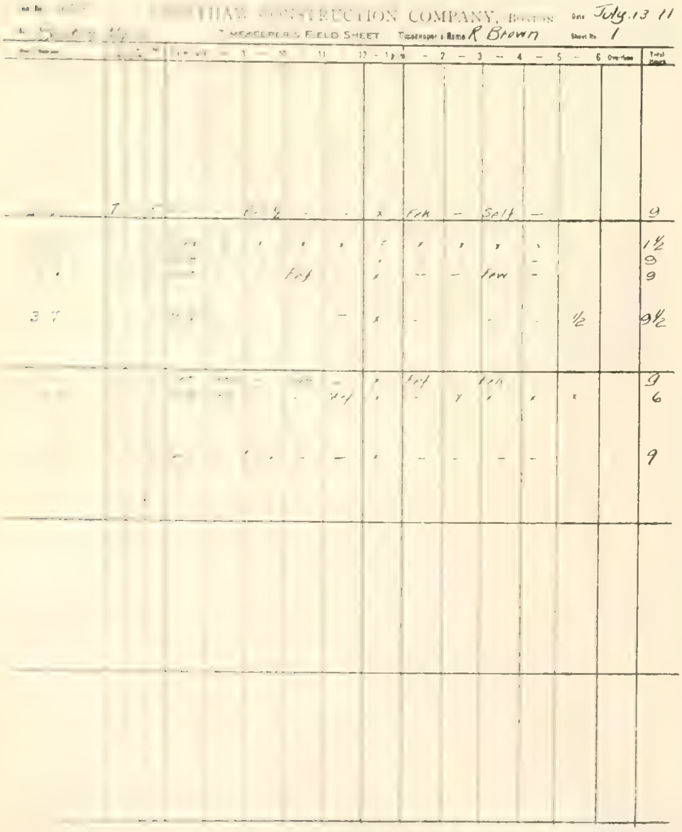
left-hand column the field numbers of the men working that day. He then makes his first round between eight and nine o'clock, observing what each man is doing and asking what he has been employed on since the start of work. By nine o'clock the first round will have been completed. As all of the men have their numbers on their hats they do not need to be asked their names. The timekeeper on his rounds fills in the Field Sheet, placing under each hour the symbol covering the work that particular man was doing at that time. Between ten and eleven the second round is made in a similar way, and this usually takes only half an hour inasmuch as the time keeper knows where to find the men more readily, and there are not many new entries to make. The third round is made between one and two and the fourth between four and five o'clock.

Time-Keeper's Field Sheet

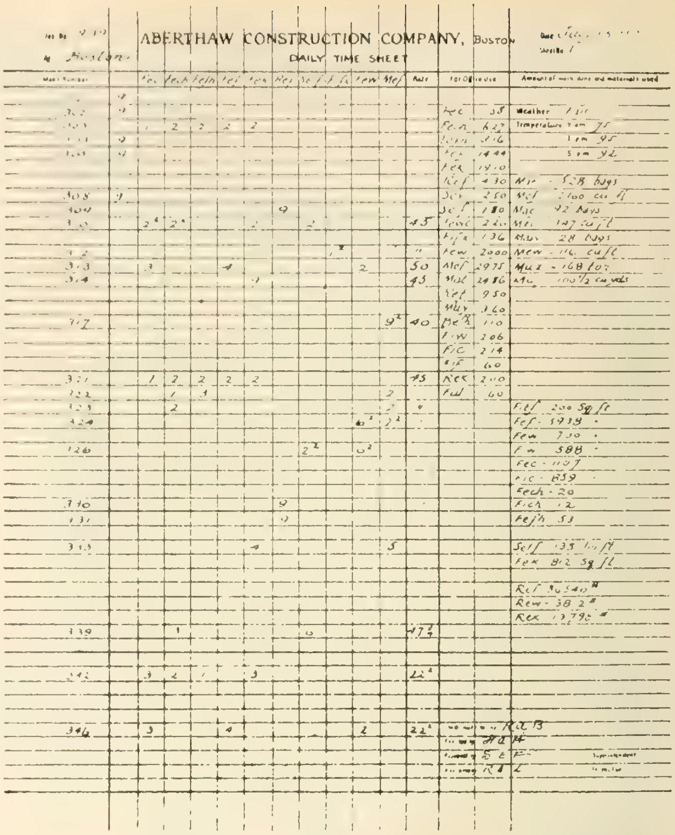
The Time-keeper's Field Sheet is pink, distinguishing it from the Daily Time Sheet, which is yellow, the Pay-roll Sheet being white. An original feature of these sheets is the fact that the horizontal rules are blue, with the exception that every tenth line is red, which means that the Time-Keeper's Field Sheet may be placed alongside of the Daily Time Sheet and the Pay Roll and the figures readily transferred without error. It is a detail showing the thought put into this cost-keeping system. A man's name always appears on the same line every day. If a man is discharged the gap is not filled up, even if only ten names appear on a sheet.

Daily Time Sheet

Between the rounds the time-keeper makes up the Daily Time Sheet from the Time-keeper's Field Sheet prepared the day before. The Field Sheet with the men's numbers kept in line. On the top line are placed the symbols representing the different kinds of work performed, and under these is recorded the number of hours spent by each man on the particular work. For instance, laborer No. 310 on the Time-Keeper's Field Sheet would be represented as spending two hours on "Fec" (that is, erecting forms for columns), four hours for "Fef" (that is, erecting forms for floors), and three hours for "Few" (erecting forms for walls). On the Daily Time Sheet under the column headed "Fec" would be placed the figure "2," under "Fef," "4" and under "Few," "3."


THAW CONSTRUCTION COMPANY, Boston Date July 13 11
TIMEKEEPER'S FIELD SHEET Timekeeper's Name R Brown Sheet No. 1

Time-Keeper's Field Sheet. Original is 8½ by 11 inches, Pink
Only the (red) tenth lines are shown


ABERTHAW CONSTRUCTION COMPANY, Boston
DAILY TIME SHEET

Daily Time Sheet. Original is 8½ by 11 inches, Yellow

When this Daily Time Sheet reaches the cost-keeping department with the Pay Roll sheet it is a simple matter to figure out the amount spent on the various kinds of work. These are placed on the Daily Time Sheet in the column headed "For Office Use." Here the cast of labor for "Fec" (erecting forms for columns), is put down, together with the other costs. The superintendent's and time-keeper's wages are added pro rata to each item.

In the extreme right-hand column of the Daily Time Sheet is placed the amount of work done and the materials used. For instance, beside the symbol "Maf" might be placed "528 bags," which would mean that 528 bags of cement were used for making the concrete for floors. Likewise "Ref" might be reported "36,540 lb." meaning that this amount of steel reinforcement was placed in the floors. The steel man reports the amount or weight of steel placed. The amount of concrete used an the number of square feet of forms used are reported by the engineer to the time keeper. If the engineer's figures do not seem to be correct, of course they have to be verified.

Copies of the Daily Time Sheet and the Pay Roll Sheet are forwarded to the head office, but the Time-keeper's Field Sheet is kept at the job. The Pay Roll Sheet is sent weekly, while the Daily Time Sheet is sent the day after the work is done.

Pay Roll

The pay roll is kept on a white sheet, as stated before, and is filled in daily by the time keeper. The total hours, and rate per man, however, are figured out weekly before the pay roll is sent to the head office. The Pay-Roll Sheet is made up from the Daily Time Sheet and is checked from the Field Sheet, thus minimizing the possibility of errors.

Owner's Inspector

The Aberthaw Construction Company place all of their cost sheets at the command of the owner's inspector. On many of the jobs the owner places a special inspector who is familiar with reinforced-concrete work, and who is able to recognize when a cost is running high. Where an inspector is placed on the job by the owner, the contractor, of course, feels more comfortable, as there is not any chance of a "come back" from the owner.

Weekly Summary Sheet

From the Daily Time Sheets it is a simple matter for the cost-keeping department to make up the Weekly Summary Sheets, which give the unit labor costs, the number of units of work done, and the amount of cement and steel used during the week. Referring to the Weekly Summary Sheet, the item "Fef" signifies the work on the floor forms. The first line gives the total expense for the week, the second line the amount of work done in square feet, and the third line the cost per hundred square feet of this work. Then would follow the total amount of work done and the average cost to date. In the case of placing concrete, the total cost is given under "Maf," which refers to the placing of concrete for the floors. In the line below follows the amount of work done in cubic yards, then the unit cost of this work, followed by the number of barrels of cement used. Below this is placed the proportions of the mix in cubic feet per barrel.

These Weekly Summary Sheets are carefully scrutinized by the officers of the company, and copies are sent to the owner and the contractor's superintendent. By looking at these sheets it can be readily seen what items are running high. If there is an undue increase in cost of any particular work, an investigation can be made and the cause corrected in time.

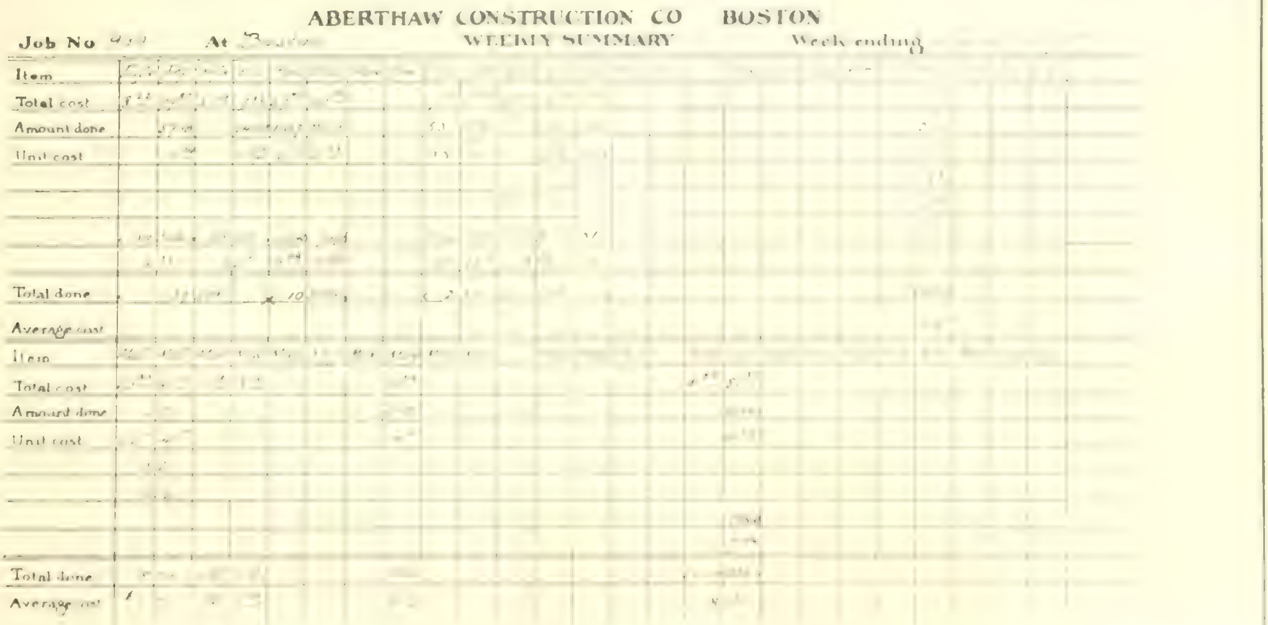
The Weekly Summary Sheet really is a barometer for the whole work. If the unit costs of this sheet go up, it indicates that there has been mismanagement somewhere, or the work is not being reported properly.

Monthly Summary Sheets

The Monthly Summary Sheet used by the Aberthaw Construction Compny is really nothing more than a trial balance in which is shown the estimated cost of the work to date in one column, and the actual cost in the next. In the third column are placed the figures representing the saving or loss. Referring to one of these sheets shown herewith, it will be noted that under the estimated cost and under the actual cost are two columns, one for labor and one for material. The actual cost of concrete would be placed at so much per yard, the data having been secured from the Weekly Summary Sheet. The estimated cost of the concrete is then put down, and can be compared with the actual cost to the date in question. The cost of granolithic finish to date can be compared with the estimated cost. Similarly, the cost for plant erection In a similar way other items, such as teaming, digging, sand, form work, steel reinforcement, excavation, etc., would be shown. By adding up all the saving items and all the loss items, it will be readily seen whether a particular job is running ahead or behind an estimate. The Monthly Cost Summary sheets give really a birds-eye view of the condition of the work, while the Weekly Cost Summary sheets show the costs in detail and more as if under a microscope.

Material Costs

Where contracts are executed by the Aberthaw Construction Company on a percentage basis, materials are purchased either by the owner or by the construction company. All depends on which party can secure the lowest quotation on any specifications for materials. If the owner purchases the material, he sends a cost memorandum to the contractors' cost-keeping



ABERTHAW CONSTRUCTION CO BOSTON

Job No At WEEKLY SUMMARY Week ending

Item

Total cost

Amount done

Unit cost

Total done

Average cost

Item

Total cost

Amount done

Unit cost

Total done

Average cost

Weekly Summary Sheet

department. If the construction company buys the material, all receipted bills are passed to its cost-keeping department by the book keepers just as soon as they are paid.

These material costs are kept by the cost-keeping department on a set of sheets in which each principal item of work such as cement, sand, stone, steel, form, lumber and nails, etc., is entered under the proper headings, with qualities and costs of each item following.

Final Cost-Summary Sheet

After the work is completed, a final Cost-Summary Sheet is made up. This sheet has two main divisions, the labor costs and the material cost being reported separately. After each of these has been compiled, the total cost of each unit is placed in the extreme right-hand column.

Referring to the sheet shown, it will be noted that concrete, forms, steel reinforcement, are divided into the several different kinds of work in which they were used. For instance, under the heading "Concrete" will be found subdivisions such as columns, floors, wall beams, granolithic finish, etc. In the first column is placed the quantity of work done. Then follow the labor items. It will be seen that the first item for concrete labor is for mixing and placing; the second is filling in voids; the third cleaning up rubbish, while the fourth is receiving and handling material. In the next column is placed the total cost of this labor. Following this column are the data of the material used. In the next column is given the cost of cement, and the next the cost of the aggregates, while following this in red ink is placed the total cost of the material. The next four columns are devoted to the cost of the plant and tools per cubic yard of concrete placed, this division being subdivided into labor, supplies and rental. Finally, in the next to the last column, is the total plant charge. In the last column is the total cost of the concrete per yard.

Job No.

ABERTHAW CONSTRUCTION CO

Cost Sheet No

SUMMARY OF COST TO

	Estimated Cost		Actual Cost		Saving or Excess
	LABOR	MATERIAL	LABOR	MATERIAL	

Monthly Summary Sheet.—Original is 8½ by 11 in., White.

Referring to the item "Forms," it will be noted that they are reported as to where they are used; that is, whether for floor slabs, wall beams, curtain walls, or window sills, etc. The first column is a report in square feet; the next refers to the making, erecting and stripping of forms; following this are the items covering the receiving and handling of form material; then follows the total labor cost of forms. The lumber cost and nail cost in connection with the forms are given, and finally the total material cost of the forms is put down. Following this are the three items composing plant charges for saw-mills, etc., with an additional one showing the cost of detailing forms in the office. Then follow the total plant charges, and finally in the last column is placed the total cost of form per square foot.

Steel reinforcement, likewise, is given under such various headings as columns, floor slabs, etc. Other costs would be put down in a similar manner. For instance, brick work would be reported as so much per thousand, inserts at so much each.

The Final Cost-Summary Sheets, as well as all the other sheets, are carefully filed for ready reference under the job number.

Paying the Men

Where a contract is executed on a percentage basis the Aberthaw Construction Company sometimes fills the pay envelopes for the workmen, or this is done by the owners themselves. Where it is done by the owner, it is made up from the pay-roll sheets furnished by the construction company, and on these pay-roll sheets is, of course, the O. K. of the owner's inspector.

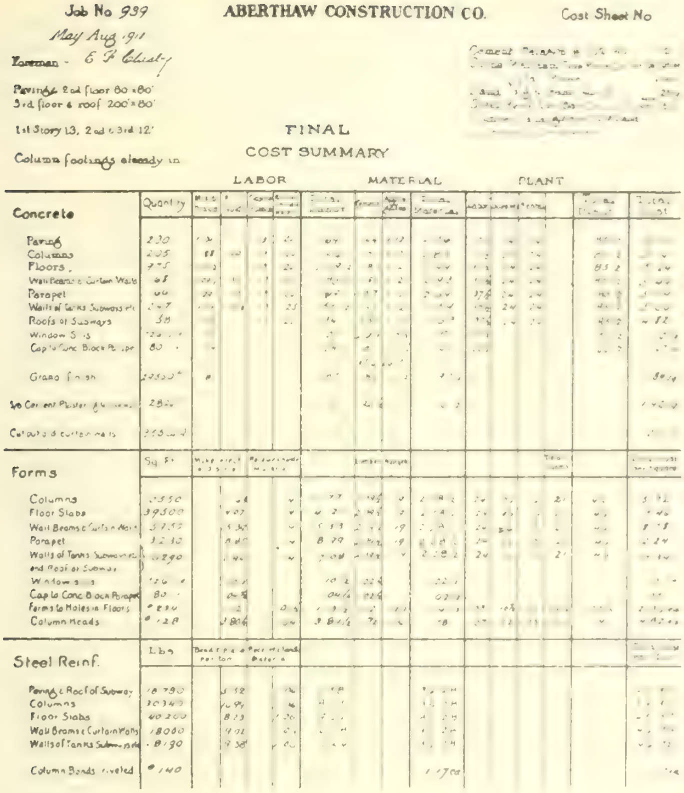
Detail of Forms in Drafting Room

The cost of form work is one of the dominant factors in determining whether a reinforced-concrete job is executed at a profit or loss. By detailing the forms in the drafting room of their home office, and by careful routing of the material, the Aberthaw Construction Company has reduced the cost of its form work 20 per cent. in the last three years.

Perhaps the best way to illustrate the system is to consider the question of form work at the ten-storey Larkin Company terminal and warehouse, Buffalo, N.Y. The total quantity of form lumber used in this work was 1,000,000 board feet. The structure is 580 feet long by 109 feet wide, and is bounded by Van Rensselaer, Carroll, Exchange and Hydraulic streets. At the home office of the company, a location plan of the beams was made. In this, similar beams were given identical numbers irrespective of location in the building itself. From this location plan, form drawings in detail were made ,a detail drawing being required for each different sized form, both for sides and bottoms, and the beams of different varieties of column forms were .also detailed.

The system of lettering used on this work is of particular note. In order to show the exact location of each form in the building, letters were suffixed to the beam numbers. For instance, a form marked BSE18 would mean that it was for the beam side of beam No. 18 on Exchange street. The bottom form for this same beam would have the symbol BBE18.

An additional number had to be added to the symbol in the case of the column forms, as there is a varia-



Job No 939
May Aug 1911
Foreman - E F Clusky
Paving 2nd floor 80 x 80'
3rd floor & roof 200' x 80'
1st Story 13, 2nd & 3rd 12'
Column footings already in

ABERTHAW CONSTRUCTION CO.
FINAL
COST SUMMARY

Cost Sheet No

LABOR
MATERIAL
PLANT
Quantity
Concrete
Paving
Columns
Floors
Wall Beams & Curtain Walls
Parapet
Walls of Tanks Subways etc
Roofs of Subways
Window Sills
Cap to Conc Block Parapet
Grano finish
Cement Plaster
Coloured curtain walls
Forms
Sq. Ft.
Columns
Floor Slabs
Wall Beams & Curtain Walls
Parapet
Walls of Tanks Subways etc and Roof of Subways
Window sills
Cap to Conc Block Parapet
Forms to Holes in Floors
Column Heads
Steel Reinf.
Lbs
Paving & Roof of Subway
Columns
Floor Slabs
Wall Beams & Curtain Walls
Walls of Tanks Subways etc
Column Bands riveted

Final Cost Summary Sheet

tion in the height of the floors. The figure "2" prefixed to the ordinary column symbol designated that the particular form with symbol 2CSE19 was the second-storey form, column side, Exchange street, while 19 is the number of column proper as specified by the original location plan.

Form details were designed complete for two storeys, and to each form detail was given a symbol to be stenciled on this form when made up, together with the number or quantity required in the first two storeys of this structure. On this same form detail, the width of the form was divided into an exact number of boards which were to make up this total width of the dimensions written on the drawing. Therefore, having given the exact length of form and the width of the different boards going to make up this form, and the total number of forms required for the job, it is quite readily seen how the sum total of boards with the exact dimensions of the stuff required was easily summed up.

Aside from these form details, it was, of course, necessary to draw plans showing assembling of forms, the chief object of this being to specify the spacing of posts and jacks, amount of bracing, and location.

From this assembly plan, together with the layout plan of the building, the exact number of pieces and size of lumber constituting the centering could be scheduled. On this completed schedule, lumber bids were obtained from the various lumber dealers before ordering the material for the job. The cost of detailing forms in the office is placed in the Final Cost Summary as shown above.

Protecting the Owner

Keeping costs on a scientific basis and allowing the owner access to all of the cost sheets, undoubtedly means that an owner can secure the highest efficiency for each dollar expended. Inasmuch as all the material may be purchased by the owner, and inasmuch as the owner may pay the men in accordance with a pay roll approved by his inspector, he has no fear the contractor will put in false material costs or pad the pay roll. Buildings erected by organizations with good cost-keeping systems will represent the best quality of work. While small work is still generally placed on a lump-sum basis, the larger buildings are now being erected more and more on percentage contracts. Especially is this so of reinforced-concrete buildings where quality should be paramount.

Cause of a Failure at Chicago

Pulling forms too soon caused the failure [illegible] combination tile and concrete roof-slab in a three-storey, 28 x 100 ft. building at 2455 Archer avenue, in Chicago, on January 15th. Concrete was deposited in the roof on December 24th, and the forms removed January 15th, when three panels of the roof settled down on the third floor, bringing down also the brick side walls. Mr. Henry Ericsson, building commissioner, states that there was no violation of the building ordinance, but the accident was simply a case of removing the supports too soon. The architect states that the concrete appeared frozen after the collapse. The roof was supported by 25 ft. girders and 14 ft. joists, 18 in. center to center and 12 in. thick. It was designed for 60 lb. live load, but failed of its own weight. The debris was supported by a floor of similar construction. The roof is now being reconstructed on the original design, the loss of $1,000 being borne by the contractor for the work.

Street Cleaning Costs from Baltimore

During the year 1912 the Street Cleaning Department of Baltimore, Md., collected 175,202 cubic yards of garbage, 455,830 cubic yards of ashes and refuse, and 490,602 cubic yards of street dirt, snow, sand, etc. In addition to these, it removed 26,983 cubic yards of dirt from sewers and sewer inlets. In performing this work it employed 197 garbage carts and 145 other carts, 250 sweepers and scrapers with the necessary drivers and helpers and 33 sewer men. The total cost of the collection of garbage and ashes was $216,720, and of the removal of garbage, $64,500. The removal of street dirt, sand, etc., cost $301,424; sweeping and sprinkling streets by machines cost $60,121; tools and repairs cost $7,885; salaries, $26,574; incidental expenses, $2,676. The total cost of cleaning sewers and inlets was $27,125, or $1 a cubic yard removed. Destruction of weeds cost $1,971. There was received from the sale of refuse, $4,097. The total payments for the year amounted to $794,000.

The most difficult feature in driving the tunnel between Lakes Kleive and Kvittingen, at the Samnanger power station, in Norway, was the opening of the intake in Lake Kvittingen. The tunnel entrance is 85 ft. below the water surface, and as it was impossible to reach it from the lake side the tunnel driving was continued toward the lake until only [illegible] remained. In this curtain 19 holes were drilled and loaded with 500 lb. of dynamite. As it would be impossible to remove the rock after the blast two ditches were blasted across the tunnel, one 16.5 ft. deep and 13 ft. long and one 8.2 ft. by 16.5 ft. The charge was exploded, and as the tunnel ran full [illegible] the part of the rock [illegible] into the tunnel was evidently washed into the ditches

The Purification of Water Supplies

Methods Supplementary to Sand Filtration and Other Systems—The Ozone and Chloride of Lime Processes*

ABSOLUTE sterility—that is, complete absence of microbes—is no doubt a consummation devoutly to be wished, and many people have devised systems by which this can be assured. Through the medium of the patent agent, various forms of filters, applications of ozone in nearly endless variety, quartz lamps for ultra-violet rays, a full set of chemicals to "drug" the water have been, after due protection was secured for the inventive genius in each case, showered on the engineering world for the immediate benefit of mankind.

Multiplicity of Systems

A multiplicity of systems is a necessary condition of competition and that struggle for existence which ultimately results in the "survival of the fittest," but in the meantime the existence side by side of so many competitors is a proof that none of them has attained to that degree of efficiency which would ensure its survival and the disappearance of its rivals.

It is only natural that the various inventors should criticize each other's systems and proclaim the advantages of their own. They all, however, agree on one point—namely, that the worst system is sand filtration pure and simple—and as this system is not patented, there is nobody constantly on the watch to defend it and to repel repeated attacks; moreover, it is practically the only system in general use, and the inventor, in trying to push his own patent, is constantly confronted with it; so that, in order to get in himself, he must of necessity endeavor to prove the defects of such a persistent rival. It must be remembered, however, that the inventor enters into this discussion with a decided bias in favor of his own discovery, that he cannot be expected to keep an open mind or to judge the question fairly and impartially.

The first laboratory experiments on water sterilization by ozone were made in Germany; the first application on a somewhat larger but still experimental scale was made in Holland; the Belgian Government adopted the system to purify the water at Blankenberghe, a seaside resort near Ostend; but it was especially in France that the system was readily taken up and that the technical and hygienical authorities made the most of it. Nice, on the Mediterranean, is at work on it; Paris is fitting up the system at the St. Maur filtering station. In Germany there are a few installations, and in Russia the utterly bad system of filtration in use at St. Petersburg has been supplemented by an ozone plant. The English-speaking countries, however, which include more than half the civilized world, seem to be very reluctant to adopt ozone purification, and there appears but little likelihood of their changing their attitude.

Objections to Ozone

There are obviously objections to its use, and among these the following may be mentioned: Its production by electrifying air is rather difficult and costly; it cannot be obtained pure; only a small percentage of the air treated can be made into ozone, so that comparatively large volumes of air have to be dealt with. The greatest objection to it seems to be its insolubility. It is, of course, unfortunate that the use of ozone involves such difficulties, for it readily destroys color and microbes, and itself turns into ordinary oxygen, so that nothing of it remains in the water. Experience has shown, however, that even with ozone complete sterilization is practically impossible, and at the same time a certain selective action has become apparent, some microbes being more easily destroyed than others; the more resistant are the ordinary harmless water bacteria, while the pathogenic bacteria are the more sensitive. Ozone is not the only compound which can evolve single atoms of oxygen in the nascent state. A variety of chemicals do the same, with the same sterilization effect. Permanganate of potash has been used at Alexandria (Egypt); the gaseous oxygenated compounds of chlorine, and lately ordinary bleach (chloride of lime) have also been employed.

Chloride of Lime

Strange to say, the chemical nature of this substance is not exactly known. There are various structural formulae, not one of them fully accounting for all the facts, but there is no doubt as to its hygienical efficiency. A dose or two of three parts per million is sufficient. Its efficiency has, however, been more effectively demonstrated by the fact of its having stopped epidemics of typhoid.

The application of chloride of lime is simplicity itself; a solution of the required quantities is made and regularly run into the water, and the plant can be started in a few hours. In some parts of America portable plants have been provided which are let out to muncipalities when required. Within a period of five years the use of this system has spread all over the States, and its efficiency is no longer questioned. No trouble has been experienced from taste. Three parts per 1,000,000 of chloride of lime represents only 1 part, or 1 milligramme per litre of chlorine, a quantity which falls within the limits of error of ordinary chemical analyses. The taste (if any) only exists just after the introduction of the reagent and rapidly disappears.

The system has also been applied in Europe, as for example, at Paris last year, but chloride of potash was used instead of chloride of lime.

There is not the slightest doubt that the chloride of lime process constitutes the greatest advance which has been made in water purification during recent years. The proofs of its hygienical efficiency are overwhelming. It acts like ozone, without the necessity of complicated machinery; it is soluble and readily diffused through the bulk of the water so that intimate contact is ensured without cumbrous mechanical appliances. The chloride of lime process is free from the attentions of the inventor, and can be arranged to suit any special local requirements.

Sulphate of alumina was introduced with the mechanical or "rapid" filter. This also comes from America. It operates by a reaction between the sulphate of alumina and the carbonate of lime present in the water, sulphate of lime being formed; carbonate of alumina ought also to be formed, but as such a combination does not exist, the alumina is precipated in large sticky flakes which form round the particles of suspended matter and carry them to the bottom. With most waters mere decantation after the addition of the sulphate of alumina is efficient in from twelve to twenty-four hours; anything not deposited then is very difficult to get rid of.

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*By Adolph Kemna, in The Surveyor.

The Use of Alumina

The use of alumina enables the water engineer to overcome the difficulty of a highly colored water which, although quite innocuous from the hygienic point of view, is very objectionable to the consumer. The treatment of water with sulphate of alumina is cheap, and easily applied, and is not open to any reasonable objection whatever. The precipitated alumina is retained by the effluent; the sulphate of lime remains in solution and is perfectly harmless; on the contrary, the casual addition of some lime to very soft waters can only be beneficial. It is, however, important to ensure a uniform distribution of the reagent through the whole mass of the water.

Sterilization by Light

Direct experiments long ago proved that ultra-violet rays are bactericidal, and the effect of prolonged storage upon microbes is certainly due to a great extent to that action. It is therefore quite reasonable to apply these rays for the purposes of sterilization.

Some lights contain a great abundance of ultra-violet rays, especially that from the mercury lamp, but ordinary glass being impervious to these rays the lamps used for sterilization must be constructed with quartz, which is transparent to the rays, but is expensive. To secure effective action the water must be quite clear, which means in the case of any ordinary surface water very complete preliminary filtration, as even a slight tinge of yellow absorbs these rays; a water which although clear has the slightest color must also be first decolorized. It will therefore be seen that in the case of surface waters the ultra-violet rays do not replace ordinary filtration nor, in some cases, the use of sulphate of alumina, but must be considered as a supplementary treatment of a precautionary nature, exactly as in sterilization with chloride of lime.

It is not quite clear how these ultra-violet rays act; there is certainly a direct physiological effect on the living protoplasm as in the case with Finsen's light cure for lupus and kindred skin diseases, but they are also known to ozonize the air, so that, after all, part of their sterilizing power may be of the same nature as that of other processes evolving nascent oxygen.

The Use of Lime

Dr. Houston, in one of his reports, has suggested the use of lime as a sterilizing agent. This substance has been used for many years to soften hard waters, the dose being calculated according to the amount of dissolved bicarbonate to be precipitated, and being itself neutralized in the process. To sterilize much more lime must be added, and after having exerted the sterilizing action this excess can be neutralized by mixing it with a certain volume of untreated water. There would also be a reduction of hardness, which would be beneficial to water such that derived from the Thames.

Speaking broadly, it may be said that all these systems apply only to surface water, but this is due to the fact that generally spring waters are naturally pure and do not require any treatment. A few only of the various systems are intended to replace the time-honored sand filtration, but most are intended to be supplementary to it. Supplementary treatment and scientific control are improvements on older methods, and there is a moral obligation upon the water engineer to do his best in the interests of his consumers, but the intelligent adoption of improved methods and new processes does not necessarily involve the disparagement of older methods which have stood the test of time.

Notes on the Disposal of Sewage Tank Sludge

THE notes here given with reference to the disposal of sewage sludge are abstracted from the paper read by Mr. Charles Brossman, Consulting Engineer, Indianapolis, Ind., before the recent annual convention of the Indiana Sanitary and Water Supply Association.

The Sludge Problem

The real problem in sewage disposal plants is the sludge problem. Engineers are just learning how to make sludge, but as yet have not found a satisfactory solution, in most cases, for disposing of it. In large plants the sludge question is the stumbling block. Sludge may be roughly divided in two classes: That from shallow tanks and that from deep tanks. Sedimentation tank sludge is a black, semi-liquid mass which, on being exposed to the air, becomes offensive, giving off much gas and odor. The water contained in such sludge is usually 90 to 95 per cent. The sludge from septic tanks ranges all the way from 8 to 45 cu. yds. per 1,000,000 gals. of sewage. Septic sludge which has been retained in tanks for a number of months undergoes a great change. The organic matter is attacked and partly gasified and liquefied, reducing the amount of sludge. Such sludge in well operated tanks is a concentrated very black mass containing from 80 to 90 per cent. of water. There is not as much odor to septic tank sludges as to the fresh sludge from the plain settling tanks.

A short description of methods of dewatering sludge by the centrifugal machine is of interest, as this method seems to have possibilities, although at the present time it is not the cheapest method in use. It is being used successfully at Frankfort, Germany, and several other cities. In the Shaffer-ter-Meer plant the sludge flows into the machine from a receiver placed above the inlet. The heavier particles of sludge are thrown outward toward the outer part of the chamber in the machine, the water being forced inward and flowing out into a water chamber. This process is kept up until the entire chamber is filled. The sludge inlet is then cut off and the entire mass is whirled around for the proper period required to dry the sludge. This dry sludge is then thrown out by centrifugal force, the impact against the walls breaking it up. The sludge then falls down and is conveyed away by an automatic conveyor. The machine runs about 750 r.p.m., and it takes from two to five minutes for one operation and from 2½ to 3 cu. yds. can be dewatered per hour. The sludge thrown off is loose and dry, sandy and weighs about 1,800 lbs. per cu. yd. The cost of operation of such a plant with the electric current at 1½ cts. per kilowatt hour is about 60 cts. per ton of the dried product. This price includes all wages, interest and depreciation. This is slightly higher than filter presses would be under the same conditions. It must, however, be remembered that the [illegible] entirely automatic and the manual handling of the sludge is entirely done away with. Consideration should also be given to the fact that the sludge is somewhat different from sludge from a filter press which has used chemical for precipitation.

Filter Presses

Pressing sludge by filter presses in order that it may be formed into a cake has been used largely in plants using chemical precipitation. This method, however, is not entirely satisfactory, as it is hard to dewater the sludge in a uniform manner. In comparison, pressing the sludge into cakes in English and German plants being as low as 65 cts. to 85 cts. per ton, it is of interest to note that the filter presses used at Frankfort, Germany, have been substituted for centrifugal machines. The cost of filter pressing, however, varies greatly, as at Worcester, Mass., it runs as high as $3.50 per ton of solids. Probably a fair average would be from 60 cts. to $1.20 per pressed cake per ton. Columbus, Ohio, stores its sludge until the river has a freshet or a large enough volume to allow its being dumped in the river without being a nuisance. Mansfield's (Ohio) septic sludge is dried in lagoons.

At the Philadelphia experiment station the wet sludge was mixed with equal parts of anthracite coal and was burned under boilers, but no efficiency tests were taken. However, an evaporation of approximately 4½ lbs. of water per pound fuel was realized, the fuel having approximately 11,000 B.t.u. per pound. It would seem that the disposing of sludge in this manner would justify experimenting, especially at such points where sewage would have to be pumped and where the sludge would have to be disposed of.

Mr. Brossmann took up the question of burning sludge in gas producers and was advised by one manufacturing company that they could burn the sludge in a proportion of one part of coal to five of sludge. This method of burning sludge in gas producers has been tried in Europe; in some cases with fair success and in others with rather poor results, but there is no doubt that to insure successful burning in producers the proportion of sludge should not be too high, and thought should also be given to the quality of coal for its effect as regards the clinker, etc. In such localities where drying is expensive and cities are located near the sea, the sludge can be loaded into barges or tank steamers and transported a sufficient distance from the coast and then dumped. The cost of such transportation varies from 7½ to 30 cts. per ton in English cities, which includes loading, etc.

Method of Constructing a Bridge Structure on Soft Bottom

BRIDGE pier reconstruction on a bottom so soft that the driving of adjacent piling caused movement of the old pier is described by Mr. C. E. Smith, Bridge Engineer, Missouri Pacific Railway, in a paper presented to the American Railway Engineer Association. The work described was located on the White River, near Augusta, Ark.

The former bridge, consisting of one 162-ft. pin-connected through truss span, one 267-ft. pin-connected rim bearing through truss draw span, a masonry pivot pier and steel shell concrete filled cylinder rest piers, two 65-ft. deck plate girder approach spans on pile piers, and pile trestle approaches, was replaced on the same center line by through riveted truss spans, having the same length as the old spans, and two 60-ft. deck plate girder approach spans, the cylinder piers having been converted into ordinary masonry piers, as described hereinafter. Both old and new bridges were designed for single track.

The old bridge had been in place 26 years when replaced, and no complaint had ever been made of boats having experienced difficulty in passing through the draw openings. Practically no change had taken place in the bank lines during that period, consequently the plan prepared for new bridge contemplated no change in location or length of draw span, but required a slight decrease in the width of the channels to permit the reinforcement of the old cylinder piers. The change in the length of deck plate girder approach spans was made for the purpose of permitting the new pile piers to be constructed in front of and in the clear of the old pile piers; these spans are simply for the purpose of spanning the sloping banks in which it is difficult to hold pile trestle, and the exact length of the girders is not important. Abutments were unnecessary on account of the necessity for long trestle approaches to accommodate floods.

The United States Engineer officer held that the very slight decrease proposed in clear opening was not of great importance, and approved the plans as first prepared. The formal approval of the Secretary of War soon followed.

The substructure reinforcement proposed at this bridge was of such a nature as to necessitate no interference with navigation, as it was decided to carry the spans and traffic on the old piers while they were being reinforced.

Each of the three old rest piers consisted of two steel cylinders 7 ft. in diameter, extending down 55 ft. to 60 ft. below the rail, which placed them about 15 ft. deep in the sandy river bed, each cylinder being supported on 7 piles, the heads of which were embedded in the concrete filling within the cylinder; the penetration of the piles was about 14 ft. below the bottom of the cylinders. The writer has never met with a better example of the supporting power of sand when confined than in the case of these cylinders; according to our present standards the cylinder piers did not have sufficient supporting power for the former bridge which they had supported without settlement for 26 years. It was decided, however, not to overload them by placing the newer and heavier bridge upon them.

Additional supporting power was secured by driving 56 new timber piles within a cofferdam 14 x 35 ft. surrounding each pair of the old cylinders, the piling having been driven to an average penetration of 35 ft. with the aid of the water jet. The new piles extend down 15 to 20 ft. below the bottom of the old piles.

The driving of the first new foundation pile with the aid of the jet caused settlement of the cylinder nearest the pile. Alarm was felt when this trouble was first encountered until it was found that the settlement immediately stopped with cessation of driving and jetting and the pier remained stationary until their resumption. Experiment disclosed that the driving of a pile with the aid of a jet near the other cylinder would cause the pier to right itself, although slightly lower than formerly. The actual height of the tops of the old piers was no longer of any importance, so driving was resumed. Piles were driven alternately at one end, then at the other, as the necessity for righting the piers arose. The tipping was permitted to go on until the tops of the piers were 3 ins. out of line, when the driving would be changed to the other end until the pier became 3 ins. out of line in the other direction. No trouble was encountered in the location of the piers in the direction of the bridge, practically no motion in that direction having been detected. This was probably due to the fact that they were guided in their settlement by the weight and stiffness of the spans resting on them.

A small amount of difficulty was encountered in keeping the track in condition for operation. The easiest condition was found at the east pier, which supported the east end of the 162 ft. approach truss span and the west end of the girder span. Here the ends of the spans were permitted to move from side to side and down with the pier.

At the west pier, which supported the west end of the draw span and the east end of the girder span, the draw span was permitted to swing free from the pier and the end of the girder span followed the top of the pier when it moved. Here it was necessary to keep the end of the girder span in line and level with the end of the draw so that trains could always cross. The ends of the draw span were supported on oak wedges during the passage of trains.

At the pier which supported the east end of the draw span and the west end of the approach span, the approach span was permitted to move from side to side and down with the pier, while the end of the draw span swung free. Track connections at the end of the draw span were maintained by shimming under the bridge ties on top of the stringers at the end of the approach span and by sliding the bridge ties from side to side on top of the steel stringers of the approach span by the assistance of steamboat ratchets.

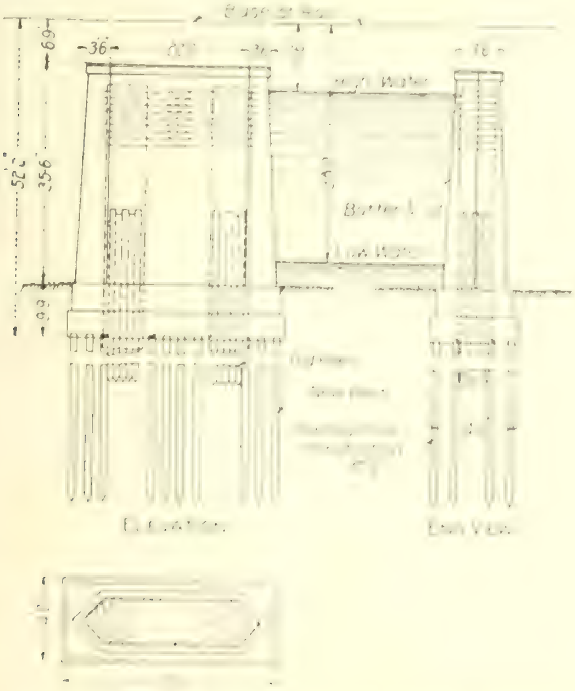


Fig. 1 Method of embedding old cylinder piers in concrete, White River Bridge.

After the completion of driving at each pier the spans were jacked up and over, where necessary, to bring track to line and level. The work was delayed very little by the necessary adjustments to track and spans. The maximum settlement of any pier during the pile driving was 13 ins.

Before the commencement of work considerable riprap surrounded the old cylinder piers, and this riprap was expected to interfere with the placing of the cofferdams. This material was excavated by dredging around the old piers down to the bottom of footing, after which the sheet pile cofferdams, and then the foundation piles, were driven. The sand that was brough up by the jets and other sediment within the cofferdams was then removed by a sand pump and the lower portion of the concrete footing placed around the pile heads under water by means of a tremie. The cofferdams were then pumped out, the piles cut off at the top of the concrete and the piers built in the ordinary manner up to the bridge seats.

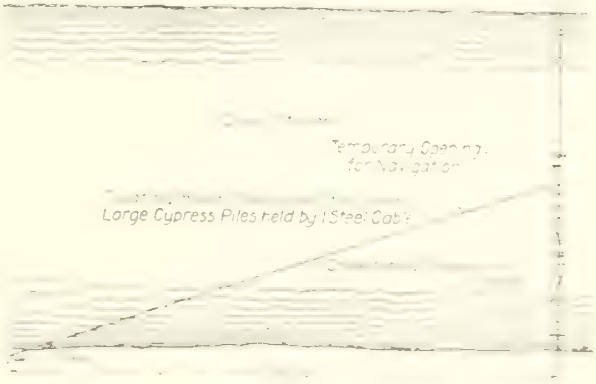

Temporary Opening for Navigation
Large Cypress Piles held by 1 Steel Cable

Fig. 2—Sketch showing location of cable to hold falsework in line and floating boom to deflect driftwood from falsework, White River Bridge.

The bridge seat course for the east pier was placed during erection while the east truss span was down; the approach girders and falsework stringers were supported on the new concrete below, the supports being moved to permit the completion of the new bridge seat in sections.

The draw rest piers were also completed while the east span was under erection. The cylinders of these piers were cut down and crossover beams placed while the draw span was swung. The ends of the crossover beams were supported on frame bents that rested on the footing projections of the piers. The bridge seats were finished off under the beams.

The question, "Why was the bridge not supported on falsework during this work on the foundation?" naturally presents itself. This was considered and also the advisability of taking down the old piers, but the fear of losing the falsework and spans in a flood caused the determination to go ahead as described. The White River is subject to sudden rise and carries much driftwood at high velocity. When this driftwood comes in contact with falsework it accumulates too rapidly to be successfully removed, with the result that it makes a mat extending the entire length of the falsework from water surface down to the bottom of the river. The pressure of the current is great and the scour of the current going under the drift very dangerous. The accumulation usually results in the bents being pushed out of line or being undermined, either condition resulting in delays to trains.

The files disclosed that in the reconstruction of another bridge across this river the above condition caused so much damage to the falsework that the bridge was out of service for about two weeks, during which time all trains were compelled to detour.

It was realized that partial falsework could have been put in and protected by floating booms, but that would have interfered with the floating equipment of the foundation contractor.

The old pivot pier was of ordinary solid masonry construction supported on grillage and piles, the piling being heavily protected by riprap; no settlement or other trouble had ever been experienced. As the former draw span was rim bearing and the new draw pivot bearing it was decided to remove the coping (using the stone for additional riprap around the footings) and replace it with a thicker slab of reinforced concrete designed to distribute the load from the new span uniformly over the pier, this reinforced concrete coping being placed between the taking down of the old draw span and the erection of the new. The experience in attempting to adjust claims from boat owners for the closing of the Black River indicated that it would be best to make provision for navigation continuously during erection. The contractor was awarded a unit price per ton for the erection of the steel, a lump sum for installing a temporary deck girder lift span, and a fixed price for each time he had to open the bridge.

At this bridge towers and counterweights were not installed, but arrangements were made to lift the entire span out by the erector's derrick car which would move back with the span. Although no trouble had been experienced at Black River, it was seen that on account of the limited amount of lift that could practically be provided at reasonable expense on temporary supports, the arrival of a large boat at extreme high water might find the lift span in its highest position too low, and it was to avoid such a contingency that the span was handled with a derrick car at White River.

Unusual high water obtained for long periods during the entire reconstruction. The substructure work was delayed by high water during the ordinary low-water period so that the erection started immediately before the ordinary high-water period, making it necessary to put in and maintain falsework during high water. Falsework was first placed under the 162-ft. east approach span, the old span taken down and the new span erected. On account of this being a riveted span, the falsework was used longer than usual, as the span could not be swung free until all connections except direct compression splices had been fully riveted. While the riveting was under way the river rose and carried much driftwood against the falsework, where it accumulated in spite of the efforts to keep it going. Upon completion of the riveting this falsework was removed at once; all the blocking and stringers and all but three bents were successfully removed by the bridgeman, those three bents having been pushed horizontally out from under the bridge without tipping by the pressure of the drift and undermining of the piles. Immediately below the bridge the bents tipped over, mingled with the driftwood and passed on down the river.

Falsework was next placed under the west arm of the draw span and the accumulation of driftwood was such as to necessitate taking unusual precautions. To hold the falsework temporarily a steel cable was passed through the bents in a long curve, the ends of the cable being attached to the upstream ends of the pivot and west piers.

An opening 50 ft. wide was left in the east draw channel just west of the east rest pier and a heavy pile bent was driven for the support of the temporary girders to be used for spanning that opening. Heavy pile bents were also constructed on each side of the pivot pier for the support of a deck girder span over that pier to facilitate the reconstruction of the coping course. To prevent more drift from accumulating against the falsework a floating boom was constructed reaching from the west pile pier of the temporary channel opening to a tree on the west bank of the river about 1,000 ft. upstream from the bridge. The boom consisted of a 1-in. steel cable to which was attached a line of 60-ft. large cypress piles, a surplus of which was on hand for use in case of emergency.

The boom did more than was expected of it. The angle between it and the current was so slight that all the large driftwood followed the boom down to the temporary opening and passed through. The small portion that passed under the boom caused no trouble whatever.

When everything was in readiness a quick change was made by removing two panels of the old draw span at the east end and installing the temporary girder span over the channel. This change consumed about two days and no boats were delayed. The dismantling of the old span, reconstruction of the pivot pier and erection of the new span out to the temporary channel was carried out carefully with the realization that unusual speed was not necessary. It was the first intention to erect and rivet up the west arm of the draw as a simple span and to remove the falsework from under that arm before completing the erection of the draw. The floating boom was so effective, however, that this was not necessary. The draw was erected and riveted with the exception of the two east panels, after which another quick move was made in the removal of the temporary deck plate girder span and completion of the erection of the draw span, which was ready for turning a few days after the deck girder span was removed.

The new deck plate girder spans were installed at odd times during the erection. During the final extension of the new draw span over the temporary channel the river was out of its banks and this high water made it possible to permit boats to pass through the end openings, the east deck girder span being removed for that purpose when necessary.

The installation of the temporary deck plate girder span over the east temporary channel cost about $400.

Each time the bridge was opened during erection cost the railway company $10.

For a period of about five years this bridge had been opened from five to ten times per month. During the erection of the new draw it was necessary to open the bridge nearly every day for the passage of boats.

The draw span of this bridge is a duplicate of the Black River draw and the various parts of the work were carried out by the same contractors. The weight of the 162 ft. through riveted truss span is about 200 tons, and of the two 60-ft. deck plate girder spans 50 tons. The total cost of the bridge was about $90,000. —Engineering and Contracting.

Many of the brick used in Prague, Austria, are yet made by hand, both women and men working in the yards. Practically all the buildings are constructed of brick and plastered on the outside. The brick are larger than those commonly used here and not so well finished, not being used for facing the outside walls. The ordinary building brick sell at about $8 per thousand. Many new buildings are being erected, which makes the brick business one of the best in that city.

Electrolysis in Reinforced Concrete

Investigations of the Cause and Extent of Damage by Electric Current and Practical Remedial Measures

DURING the last few years attention has been called to the possibility of damage to reinforced concrete structure by stray currents from electric railways and other power sources. The laboratory experiments of Toch, Knudson and Langsdorf, in 1906 and 1907, showed quite clearly that under certain circumstances the passage of electric current from the reinforcing material out into the concrete gave rise not only to serious corrosion of the reinforcing material but also to cracking and disintegration of the surrounding concrete throughout the structure.

Recognizing the importance of the subject, and acting in response to requests from numerous sources, the United States Bureau of Standards has since the summer of 1910 been conducting a thorough investigation of the cause and extent of damage to concrete by electric current and the best way of mitigating the trouble under practical conditions.

The investigation has been conducted along the following lines:

(1) Laboratory studies of the cause and nature of the phenomena caused by the passage of electric currents through concrete.

(2) Observation in the field with the view of establishing definitely the probable extent of the danger in practice and the circumstances under which trouble is most likely to occur.

(3) A study of the various possible means of mitigating trouble from this source, leading to specific recommendations based thereon.

The reports of previous investigators that the passage of current from an iron anode into normal concrete caused destruction by cracking were only partly confirmed. This effect did not occur in most of the specimens tested when the potential gradient was less than about 15 volts over a distance of 3 inches, or about 60 volts per foot of anode.

Among the numerous theories that have been advanced for the cracking, the one which attributes it to oxidation of the iron anode following electrolytic corrosion has been fully established. The oxides formed occupy 2.2 times as great a volume as the original iron, and the pressure resulting from this increase of volume causes the block to crack open. Metals which do not form insoluble products of corrosion and all non-corrodable anodes never cause cracking of the concrete as a result of the passage of an electric current.

Suggestions of some engineers that copper-coated steel, or aluminum, be used as reinforcing material have been shown to be impracticable, since the copper coating is readily destroyed and the aluminum is attacked by the alkali in the concrete.

The addition of a small amount of salt to concrete, as is frequently done to prevent freezing while setting, has a twofold effect. First, it greatly increases the initial conductivity of the concrete, thus allowing more current to flow, and, second, it destroys the passive condition of the iron at ordinary temperatures, thus multiplying by many hundreds of times the rate of corrosion and consequent deterioration of the concrete. Salt should, therefore, never be used in structures that may be subject to electrolytic action. Further, reinforced concrete structures built in contact with sea water or in salt marshes are very susceptible to trouble from electrolysis.

Contrary to the observations of previous investigators, a distinct softening of the concrete near the cathode was observed. This begins at the cathode surface and slowly spreads outward, in some cases ¼ inch or more. After exposures to the air this softened layer becomes very hard again, but remains brittle and friable. This softening effect causes practically complete destruction of the bond between the reinforcing material and the concrete, reducing it to a few per cent. of its normal value. Unlike the anode effect, which becomes serious in normal concrete only on comparatively high voltages, the cathode effect develops at all voltages, the rate being roughly proportional to the voltage in a given specimen. For this reason it may frequently occur in practice, and is, therefore, a more serious matter practically than the anode effect about which so much has been heard.

Observations have shown that the softening of the concrete only takes place very close to the cathode, the main body of the concrete remaining perfectly sound without loss of strength. Because of this effect the method of protecting reinforced concrete buildings by connecting the reinforcing material as a cathode to a battery or booster would be much more dangerous than no protection at all.

Non-Reinforced Buildings

Non reinforced concrete buildings are immune from trouble due to stray earth currents. They might, however, be injured by the grounding of power wires carried in conduits embedded in the concrete, since these conduits would then act as electrodes.

Conditions do arise in practice which will cause damage from stray currents, but the danger from this source has been greatly overestimated in many quarters. While precautions are necessary under certain conditions, there is no cause for widespread alarm. Waterproofing reinforced concrete would greatly increase its resistance and diminish accordingly the danger from the anode or cathode effects.

Painting or otherwise coating iron with an alkali resisting metal preservative before embedding it in concrete may serve to minimize the dangers of electrolysis, but no such coating has been found that does not prevent the formation of the bond between the concrete and iron when the concrete sets.

All electric power circuits within the building should be kept free from grounds directly on a portion of the building itself. If the power supply comes from a central station the local circuits should be periodically disconnected and tested for grounds and for general defects in the insulation. In isolated plants ground detectors should be installed and the system kept free from grounds at all times.

All pipe lines entering concrete buildings should, if possible, be provided with insulating joints outside the building. If a pipe line passes through a building and continues beyond, one of these insulating joints should be placed on both sides of the building. [illegible] ing of electric conduits to water pipes and ground plates is in general not to be recommended in the case of concrete structures.

Lead-covered cables entering such buildings should be insulated from the concrete. Wooden or other non-metallic supports which prevent actual contact between the cable and the concrete will give sufficient insulation for this purpose. Such insulation of the lead-covered cable is desirable for the protection of the cable as well as the building.

In making a diagnosis of the cause of damage in any particular case the fact that a fairly large voltage reading may be obtained somewhere about the building should not be taken as sufficient evidence that the trouble is due to electrolysis. The distance between the points and particularly the character of the intervening medium are of much greater importance than the mere magnitude of the voltage reading. As a precautionary measure, however, all potential readings about a reinforced concrete structure should be kept as low as possible.

Proposed New School at North Battleford, Sask.

THE design for the proposed new school building at North Battleford reproduced herewith is a further evidence of the progress and prevailing prosperity of western towns. A feature of western development is that the towns and cities are building commodious school buildings with a view to future expansion. North Battleford, which has a population of about 6,000, already has two fine schools. A large collegiate institute, estimated to cost $200,000, is now under construction, and the contract has just been let for another building, the one shown herewith, estimated to cost $150,000. This will be a 12-roomed school built of pressed brick, with stone trimmings. The floors will be of hardwood and the corridors and stairs of reinforced concrete. The superstructure will be of steel. Rapid exit in case of fire will be facilitated by exceptionally wide stairways and corridors. The building is steam heated by the vacuum system, operated by two 50 h.p. boilers. An efficient mechanical ventilating plant, operated by motors, will be installed.

North Battleford School. Estimated cost, $150,000

At the Atlantic Terminal, foot of Commerce street, Brooklyn, piling was being placed for two large reinforced concrete storage warehouses. Wooden sheet piling was at first tried, but found inadequate and Wemlinger corrugated steel sheeting substituted. The 10-foot sheet piles were set up by hand between the first ranger and a guide plank. The sheets were then pushed rather than driven into the ground by the use of a 4 x 6 x 16-foot yellow pine lever, the short end of which was passed through a chain loop and the long end seized by three men who would apply their weight to the lever, which rested on the piling as a fulcrum. While this was being done the sand at the foot of the pile was loosened by a 1½-inch water jet operated by another man. Piles were driven as rapidly as the lever could be operated, 70 sheets being set by five men each eight-hour day. The cost of placing was about 2.6 cents per square foot. Altogether 59,640 square feet of piling were placed in this way.

The "Church Messenger" says: "Fire insurance companies that paid losses on the reinforced concrete warehouse of the Burlington Blanket Company at Burlington, Wis., some time ago, learned something new about how such fireproof structures should be built. This warehouse was looked upon as one of the most desirable unsprinklered risks in Wisconsin. But when lightning hit it, the current went into the reinforcing and followed it through the building. The reinforcing had been simply laid in, without "tying," and here and there it had spread apart. Wherever the circuit was thus broken an arc was formed, and these arcs practically blew the building to pieces. A total loss on building and contents resulted.

A meter-handling motor truck, equipped with a light steel framework supporting an overhanging I-beam trolley track and chain block has been placed in service by the Water Department of St. Louis, Mo. The truck is a 1½-ton Federal machine designed to unload quickly meters weighing as much as ½ ton. The overhead I-beam extends about 3 feet beyond the tailboard of the truck so that when the latter is backed against the curb the meter can be picked up by the chain block directly from its vault under the sidewalk, raised and run back onto the truck. In setting a meter the operations are reversed. The truck covers a route of 15 to 30 miles daily in transferring men from one job to another. A crew of six men is said to do work which formerly required the services of ten men and five single horse wagons.

A motor vacuum street sweeper was subjected to a test recently in Manchester, England. As described in the "Surveyor," the mechanism consists of a cylindrical brush composed of a series of small brushes, which revolve in an air-tight sheet-iron shell in the opposite direction from the wheels of the car. The sweeping roller rotates at a circumferential speed of 4,950 feet per minute, and in turning through two-thirds of a revolution inside the shell raises the sweepings and discharges them into boxes in the receiver at the back of the vehicle through an opening contrived for the purpose. During the test the machine is said to have swept 2,933 square yards of street surface in 18 minutes, collecting 2 tons of material.

The old saying that "there is nothing new under the sun" is well exemplified in the discovery that a four-storey bank building erected in the city of Providence, R. I., in 1823 showed when it was demolished recently that use was made in its construction of the skeleton frame principle. It goes without saying that steel construction was unknown in 1823, but in the building wooden timbers were used instead of steel in very much the way that steel is employed in our modern skyscrapers. The skeleton building in question was erected on huge logs of spruce, while the brick front with its granite facing was tied to the frame with great bolts at each floor.

Noteworthy Development at the Coast

Season of 1913 Promises to be Busiest on Record—Many Large Contracts in Prospect — Features of the Work

Correspondence of the Contract Record

THE improvement of weather conditions during the closing days of March heralded the commencement of the season's building operations in real earnest throughout the lower mainland and interior, and on Vancouver Island. The outlook for the month of April is considered exceptionally promising, by those closely in touch with the situation, and the impression prevails generally in constructional circles that the present season in British Columbia will prove to be the busiest on record. Some uneasiness continues to be felt regarding the present state of the money market, many large contracts on which work was scheduled to commence earlier in the season still being held up on account of the owners' inability to raise the necessary funds. A noticeable improvement in this phase of the situation became apparent before the end of March, and it is safe to state that a majority of those connected in any way with the building and construction trades are confident that no serious set-back will be experienced when the season is a little further advanced.

As a proof of the tremendous development that is taking place at the Coast it is interesting to note that the value of permits issued at Vancouver for the first three months of the present year eclipsed those for the same months in 1912 by over $700,000, the amounts being $3,335,407 in 1912, and $4,072,713 in 1913.

Many Large Contracts Projected—Another Huge Department Store For Vancouver

Plans were recently completed by Mr. W. H. Wenyon, architect, for the new Woodward Department Store which is to be located on the site of the present building at the corner of Hastings and Abbott streets, Vancouver. It will have a frontage of 152 feet on Hastings street, and 132 feet on Abbott, and will be 10 storeys in height. The style of architecture is Neo-Grecian, and the construction will be steel frame on a concrete foundation, the street elevations to be faced with Haddington Island stone. A granite base will be placed in the space below the show windows. One of the outstanding features of the architecture will be the large Corinthian columns on both street elevations, which extend to a height of 43 feet and are 4½ feet in diameter. A carved band of stone near the top of the building will give a further touch of decoration. Bronze entrance doors will be placed in the facade on Hastings street and Abbott street. Alaska marble will be used for the stairways which are to be 20 feet in width. B.C. fir will be used for the interior woodwork throughout. The floor space provided in the building will be 200,000 square feet. The arrangements of the interior will conform with the latest ideas in department store equipment and construction. The first part of the structure to be erected will be that of six-storeys on the lane leading off Abbot street, and it is expected that the entire building will be completed during the summer of 1914, at a cost of approximately $500,000. Tenders have not yet been called for.

Plans were recently completed by Mr. W. F. Gardiner for a new five-storey rooming house, which is shortly to be erected on Pender street east, Vancouver, for Messrs. Barret & Deane. The structure will cover an area 75 x 122 feet in extent, and will have steel frame up to the first storey, the upper part to be of mill construction. The front elevation will be faced with pressed brick and common brick will be used for the exterior of the remaining elevations. All partitions are to be of hollow tile. The entrance and stairways are to be of British Columbia marble, as well as the wainscotting in the entrance hall. The hall downstairs will be panelled and beamed. The interior woodwork throughout will be of B. C. fir. Oak veneer will be used on the doors of the entrance. The building will contain 150 rooms, and the ground floor will be occupied by four stores. An oil heating plant is to be installed. The cost is placed at approximately $80,000.

The management of the British Columbia Electric Railway Company, Limited, have called for tenders for the construction of a building for the use of its motormen, conductors, and shop employees who are stationed in Vancouver. The building will be located at the corner of Main and Prior streets, in the heart of the city, and directly opposite the principal car barns in Vancouver and the repair shops maintained at that point. The block will be 25 feet by 60 feet in size, and five storeys in height, the type of construction being reinforced concrete with facings of brick and artificial stone. The estimated cost of the building is about $35,000. There will be two entrances to the ground floor—one from Main street and the other from Prior street. On the Main street frontage will be located the Depot Master's office, and behind this, a large waiting room for the men. The entrance from Prior street is at the rear of the block, and leads to the elevator and stairways by means of which the upper storeys are reached. Above the ground floor the first floor will be used for lockers for the men, the second floor for a reading room, and the third floor for a billiard room with room provided for one billiard and two pool tables. On the upper storey will be located the gymnasium for the men, the entire area of the floor being left for this purpose, and the room being 18 feet in height. The company will equip the gymnasium with a full outfit of apparatus. Lavatory accommodation will be provided on each floor, and shower baths are planned for the gymnasium. The entire building will be heated with hot water. Work will be started on the building at once, and it is planned to have it ready for use during the coming summer.

Building Progress at the Coast

The footings of the new million dollar C. P. R. station at Vancouver having been put in place at the end of March, work has commenced on the erection of the steel frame, and it is expected that considerable progress will be made on this big contract during April. The building for the present will stand three storeys above the street, but will be five storeys above the track level. It is planned to erect additional storeys as needed and with this end in view the foundations and framework are being made of [illegible] and weight. The Westinghouse Church Kerr Company, of New York and Vancouver, has charge of construction.

Good progress is being made on the construction of the new reinforced concrete warehouse building for the Merchants' Ice & Coal Storage Company, Vancouver. This building is situated on [illegible] by 100 feet. It will be erected to a height of two storeys for the present, but provision has been made in planning the structure to permit of the addition of [illegible] quired. The [illegible]

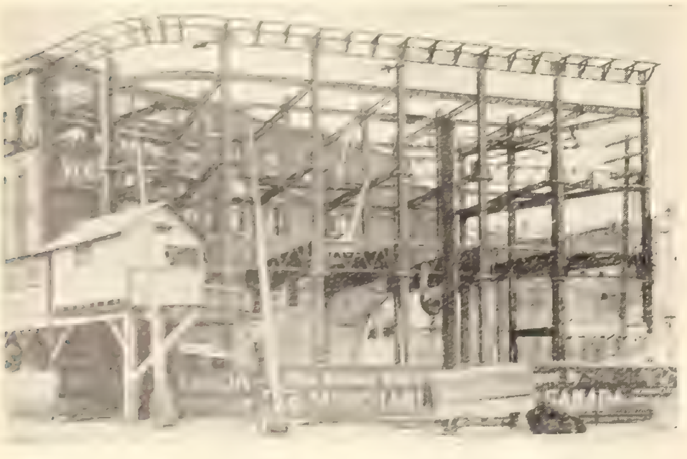
[illegible] and the most up-to-date methods of fire-proofing will be employed throughout. There are six elevators in the building. The Norton Griffiths Company is carrying on the contract. Mr. Thos. Hooper prepared the plans.

Freak Structure for Chinese Interests

The [illegible] freak structures has not heretofore been a feature of building operations in British Columbia, and the announcement stating that the Sam Kee interests have authorized construction of a four-storey steel frame building on Pender street, measuring only 6 feet wide and 120 feet in length, is naturally creating some interest among local architects and contractors. The reason given for the small depth is that in widening Pender street the city appropriated all Mr. Kee's property except this strip 6 feet wide by 120 feet long. So narrow is the proposed building that above the ground floor it was necessary to show a continuous row of bay windows in order to provide space for the staircase. On the ground floor there will be six stores. These will be so small that people will not enter to make purchases, but will do their buying from the sidewalk. A spiral staircase will lead to the upper storey. The basement will be occupied by a restaurant. The upper storeys are to contain sleeping quarters. Messrs. Byran & Gillan are the architects for this building, which will be erected by Chinese labor.

A four-storey apartment building measuring 50 x 120 ft. will shortly be erected on Seymour street near Helmcken street, Vancouver, for Mr. D. Roberts, at an approximate cost of $65,000. It will be of mill construction with front exterior facing of buff pressed brick trimmed with Terano stone. An ornamental canopy will be erected over the entrance; steps leading to the main entrance will be marble and the same material will be used to decorate the entrance vestibules. The building will contain 40 suites of two and three rooms each. These will be fitted up in a very complete manner. Fir is to be employed as inside finish throughout. Mr. G. P. Bowie is the architect.

The steel frame for the three-storey building that the Merchants Bank of Canada is erecting at the corner of Hastings and Carral streets, Vancouver, is now in place, and work on the concrete portion is almost completed. This building has a frontage of 27 feet on Hastings street, and 79 feet on Carral. The exterior facing will be terra cotta and stone. The ground floor will contain the banking quarters, vaults and safety deposit boxes. The upper floors will be reserved for offices and sleeping quarters for bank employees. The cost of the building is estimated at approximately $100,000. The structure is so planned that seven additional storeys may be added when desired. Messrs. Somervil & Putnam prepared the plans and the Norton Griffiths Company is carrying out the contract.



Merchants' Bank, Vancouver under construction. Contractors: Norton-Griffiths Steel Construction Company, Limited

Construction work is nearing completion on a four-storey business block and rooming house situated on the corner of Powell and Dunlevy streets, Vancouver. The building measures 75 x 122 feet. The exterior elevations are of cream pressed brick with B. C. granite up to the first storey, and sandstone window sills. Granite columns with capital base and label heads decorate the main entrance. The building makes provision for the banking quarters of the Japan and Canada Trust Savings Company, as well as for eight stores and 125 offices in the three upper storeys. Granite piers extend round the bank section. The entrance vestibule to the bank has handsome bolection raised panel with enriched framing, and this work is carried throughout the vestibule. The fittings of the bank are highly decorative in fir with a mahogany stain. The counters are marble and the floors are of white tile. A reinforced concrete vault eight feet by eight feet in dimension is built in the bank. In the upper part of the building, interior finish is of fir throughout. The entrance to the offices is to be finished with marble stairs and wainscotted with the same material, while the halls on the upper floors are to be panelled in fir. The building will be heated by steam, and each room will be supplied with hot and cold water and telephone. Townsend & Townsend are the architects for this structure, which represents a total expenditure of $100,000.

A six-storey and basement mill construction building was recently completed on Cordova street, Vancouver, for the Vancouver Realty Company, at a total outlay of $80,000. White glazed pressed brick, trimmed with cement, was used for the front exterior finish. The ground floor contains two stores, social room and offices of the building. The five upper storeys are occupied by 150 well fitted rooms. The elevator and entrance halls are decorated in marble. All interior wood finish is B. C. fir. Mr. Campbell Hope was the architect, and Wm. O'Dell had charge of the contract.

Mr. H. Murray, contractor, has almost completed work on the new six-storey Hotel Connaught, which is located on Pender street, Vancouver, between Richard and Homer streets. The building is of steel frame, and mill construction with front exterior facing of buff pressed brick. The lobby on the ground floor measures 20 x 60 feet, and the bar-room covers the same area. The interior woodwork is B. C. fir with the exception of the bar-room, which will be finished in mahogany veneer. Altogether the building will contain 110 rooms, with 30 private and semi-private baths. The cost of the structure will be in the neighborhood of $70,000.

Work has just started on a new three-storey mill construction building on Nelson street, Vancouver, for the Bachelors' Club. The dimensions are 33 feet by 115 feet. Tapestry brick will be used for the front exterior facing. An entrance porch, flanked by large colonial pillars and ornamental iron verandah railings will be features of the exterior. The main entrance hall and the lounge on the ground floor will be panelled in fir. Beamed ceilings will be a feature of both apartments, a large dining-room, kitchen and service room are also situated on the ground floor. The first and second storeys will be devoted to bedrooms, of which there will be thirty. Hot and cold water will be installed in each room, and on each floor there will be public baths and a separate shower bath.

For the interior finish of the building fir will be used throughout. The structure will be heated by steam, the boilers and coal storage space being in the basement. Messrs. Stuart & White are the architects for this building which will be erected at a cost of approximately $25,000.

Work has proceeded with scarcely a break since the 1st of March on the new Canada Hotel Building situated on

Richards street between Dunsmuir and Pender streets, Vancouver. Mr. E. J. Ryan has the contract for this building, which measures 50 x 120 feet and is of steel and mill construction, faced with buff pressed brick and stone. The exterior walls have been completed to the full height of seven storeys and work on the interior is rapidly forging ahead. The cost of this structure is placed at approximately $150,000. Mr. Emil Guenther is the architect.

Rapid work is in evidence on the construction of the new Regent Hotel which is being erected on Hastings street, near the corner of Main street, Vancouver. The building is of cement frame construction, with steel supporting columns to the second floor, and mill construction above. Mr. Emil Guenther prepared the plans, and the J. J. Franz Construction Company is in charge of the contract. The cost will be about $150,000.

The exterior finishing on the new Duke of Connaught High School, New Westminster, was recently completed, and Messrs. Gardiner & Mercer, the architects, expect that the entire contract will be finished by next July. This school is costing approximately $120,000. The new building measures 180 x 66 feet, and is constructed of Clayburn pressed brick with Terano stone trimmings. There is also in the rear of the school building not incorporated in the above measurements, a large assembly hall measuring 40 x 75 feet. The school building stands three storeys high, the ground floor being devoted to manual training, domestic science, recreation rooms, and the heating and ventilating plant. The two remaining floors will be occupied by eight class rooms physical and chemical laboratories, principal's room and teachers' rooms, library and cloakrooms. On the second floor provision has also been made for a dining room for those students who carry mid-day lunches. The building is thoroughly modern throughout, being provided with adequate fire-escape and light, ventilating and heating facilities.

Construction work will be commenced at an early date on a fine new eight-storey office building to be erected on Government street, Victoria, for Mr. R. T. Elliot. The building will have a frontage on Government street of sixty feet, and a depth of 120 feet. Two stores will occupy the ground floor, while each of the upper floors will be occupied by fifteen offices. The plans have been prepared by Mr. Jesse Warren, a well-known Victoria architect, and call for a building strictly up-to-date and fireproof throughout. It is expected that the cost of construction will reach $175,000.

A paper was read by Mr. A. D. Creer, assistant engineer to Mr. R. S. Lea on the Burrard Peninsula Joint Sewerage Scheme, before a recent meeting of the Vancouver branch of the Canadian Society of Civil Engineers. The main features of the scheme were outlined, together with the meterological, tidal and other data on which the conclusions were based, and an interesting discussion followed, in which several members took part. The discussion turned principally on the present practice of permissable velocities in large and small sewers, as opposed to the velocities considered feasible by the older sewerage authorities.

The Civic Associated Charities & Relief Committee, Vancouver, recently instructed Mr. A. F. Perry, a local architect, to prepare plans and specifications for the proposed Old Peoples' Home in Hastings Townsite. The new building will be of brick construction and fireproofed. It will afford accommodation for 60 men and 20 women, and will cost in the neighborhood of $50,000. It is expected that tenders will be called for at the end of April.

Plans are in course of preparation by Parr, Mackenzie & Day, architects, for a four-storey mill construction building to be located at the corner of Pender and Main streets, Vancouver. The front exterior facing will be pressed brick and terra cotta, and the dimensions of the building will be 57 x 120 feet. The entrance hall will be [illegible] in marble and tile, and B. C. fir is to be used as interior finish throughout. The ground floor will be occupied by six stores and the upper storeys will contain eighty rooms.

Mr. C. H. Rust, city engineer of Victoria, B.C., and Mr. R. H. Thompson, the provincial government's special engineer for Strathcona Park, Vancouver Island, were recently appointed by the government to investigate the Burrard Peninsula joint sewerage scheme, as proposed by Mr. R. S. Lea, of Montreal.

Plans of a proposed new building to be used as a Creche on Haro street, Vancouver, are now in course of preparation by Mr. A. Williams, architect. The structure is to measure

Two Prominent Victoria Buildings

Excavation is now proceeding for the British Columbia Permanent Loan Company's new ten-storey office building to be erected at the corner of Douglas and Yates streets, Victoria. The building was designed by H. S. Griffith, of Vancouver and Victoria, and will be of steel frame construction, fireproof throughout. The exterior finish will be pressed granite up to the second [illegible] level and the remaining nine storeys will be faced entirely with matt glazed terra cotta, with heavy enrichment in the two upper storeys. The ground floor is especially designed to suite the requirements of the B. C. Permanent Loan Company and the [illegible] Finance Company. The offices of both companies, as well as the main entrance and elevator halls, will be finished throughout with marble and mosaic floors, and mahogany woodwork. The upper nine floors will be devoted to offices. These will be finished throughout in hardwood trim. All corridors will be finished with marble wainscotting and terrazzo and marble stairs. The estimated [illegible] ing is placed at $200,000. The Sound Construction Company, Vancouver and Victoria, has charge of the contract

Proposed office building for the B. C. Permanent Loan Company
Contractors: Sound Construction Company

[illegible] and will be two storeys in height with full basement. An appropriation of [illegible] has been made by the [illegible] Memorial [illegible] and Relief Committee for this [illegible] and it is announced that construction will commence in the near future.

The Richmond Municipal Council has decided to make an application to the Public Works Department for provincial assistance toward the erection of a new court house building at Steveston, Fraser Valley, B.C.

The new court house which it is proposed to erect in Victoria is to be a replica of the Provincial Court House in Vancouver. It is estimated that the building will cost about $1,000,000. Construction will, in all probability, not start on the building until next year.

Messrs. Helyer & Archer, architects, Vancouver, are preparing plans for the proposed Captain Robert F. Scott Memorial Seamen's Home, to be located on Alexander street, near Carrall, Vancouver. The building will probably be seven storeys in height, and the estimated cost is $100,000.

The Nanaimo City Council is planning considerable extensions to the city waterworks system. During the next three years $115,000 will be expended in the laying of new four and six inch mains, and in addition to this amount, the ratepayers will be asked to vote the sum of $50,000 for repair work, and the extension of the distribution system within the city limits. Over 19 miles of mains will be laid, fourteen of which will be within the city limits and five miles in the suburbs.

The Victoria Branch of the B. C. Stationary Engineers' Association held their second open meeting on March 20, when a very interesting lecture on "Electric Generators and Motors, Their Care and Management," was delivered by Mr. Graham Kearney, B.Sc. After closing the lecture Mr. Kearney answered various questions on practical points put by the members and their friends.

At a recent meeting of the Vancouver School Board it was decided, on the recommendation of the Building Committee, that a clause be added in future contracts that only British subjects be employed on any school buildings under construction.

The Dewdney Gravel Company, Eburne, B.C., are putting in a Fitzgibbon distilling marine boiler in connection with their gravel washing system.

The Waterous Engine Works, Limited, Vancouver, recently delivered a 12-ton road roller to Maple Ridge municipality, Fraser Valley, B.C. There are now 34 Waterous Company rollers in British Columbia, and the interest now being taken in good roads should lead to the number being doubled three years hence.

Contracts aggregating $130,000 in connection with the New Westminster Harbor scheme were awarded recently. The tenders accepted were for material and equipment.

Mr. George Chew, a railway contractor who has almost completed a portion of the Canadian Northern Pacific Railway, and who has a contract for a 12-mile stretch of the Kettle Valley Railway, stated in Vancouver recently that there are now 4,000 men working in the Kettle Valley right-of-way, and that rapid progress is being made.

Sir John Jackson, head of the well-known English contracting and engineering firm that has undertaken the construction of the Victoria breakwater, recently paid a brief visit of inspection to the scene of operations at Ogden Point. Sir John could not give an opinion as to how long it would take to complete the work, as the exact term of operations could be determined only by progress upon the work, and he did not propose to predict anything that might turn out to be wide of the margin. No time, however, would be lost in handling the contract.

Work was scheduled to commence early in April on a new dock and warehouse for Mr. A. J. Forsyth to be located on False Creek at the foot of Smythe street, Vancouver. The dock will be 400 feet in length, and will extend out over the water for a distance of 225 feet. The width of the dock will be 55 feet. Upwards of two hundred and fifty wooden piles will be used. A one-storey corrugated iron warehouse 55 x 75 feet in extent, is to be erected on the land side of the wharf. Mr. T. H. Bamford prepared the plans, and the cost of the entire work will be about $7,000.

Good Outlook for Calgary

Correspondence of the Contract Record

THE building and industrial development of Calgary this season promises to be very brisk. Despite the fact that there is a pronounced tightness in the money market and that very little real estate has changed hands of late, trade conditions are good.

This spring work will be rushed ahead on the new C. P. R. Hotel with all possible speed, according to Mr. H. A. Singley, western manager for Peter Lyall & Company. It is expected that the structure, which will be the largest and most up-to-date hostelry in western Canada, will be finished by next Fall. Work on other large buildings under construction is also progressing rapidly.

The Sherwin-Williams Company will erect a large warehouse here and make this city the central distributing point for their products in Alberta. The Canadian General Electric Company and Canada Foundry Company are also erecting large four-storey warehouses for their business in Calgary and surrounding territory.

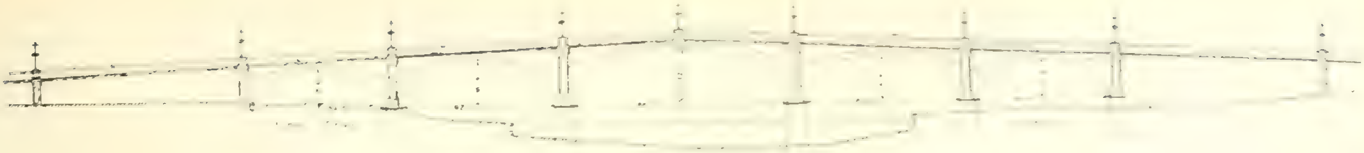
Where the Royal Hotel stands on Eighth avenue, the Merchants Bank of Canada will erect a magnificent structure. Plans are now being prepared. It is probable that the Royal Hotel building will be pulled down this month and work on the new structure commenced as soon as possible.

An addition to the present Holy Cross Hospital will also be made this spring. This will give the institution twenty more wards, besides case rooms, etc., and complete the general scheme of the building.

A new examining warehouse is now under construction on First street east, which is set down at a value of $500,000. Building permits have also been taken out for the new home of the North-west Travellers' Commercial Association. The J. H. Ashdown Company will build a warehouse valued at $46,000, according to plans prepared by Mr. J. H. Russell, of Winnipeg.

Diversion of Main Line of C. P. R.

Tenders closed yesterday (April 15) for the construction of a diversion of the C. P. R. main transcontinental line starting from the mile 69 Mountain division, which is one mile west of Six Mile Creek, B.C., and ending at Mile 92, two miles west of Cambie, mileage 89 on the new line. It is officially stated that the grades on the present line from mile 69 to 84 are plus 2.2 per cent. compensated; from mile 84 to 85 at the summit, Rogers' Pass, they average plus 0.5 per cent., and from mile 85 to 92 they are minus 2.2 per cent. compensated. On the new line the grades from mile 69 to 75¾ will be one per cent. compensated; from mile 75¾ to 76½ plus 0.5 per cent.; from mile 76½ to 81½ plus 2.2 per cent. compensated; from 81½ to 86½ plus one per cent.; from 86½ to 86¾ minus 0.10 per cent.; from mile 86¾ to 87½ minus .50 per cent.; and from mile 87½ to 89, minus 2.2 per cent. compensated. On the new line the summit will be lowered 533 feet, the distance shortened three miles and the curvature reduced by 2.356 edgrees. There will be 4½ miles of show sheds and 2,260 feet of steel bridges eliminated. There will be a double track tunnel, 28,000 feet long, on a tangent with plus 1 per cent. grades from the east portal for five miles, and a minus of 0.1 per cent. grade to the west portal for 1,600 feet. Where found necessary the tunnel will be lined with concrete.



Proposed high level bridge over the Rideau Canal, Ottawa

Ottawa Reports Many Important Projects

Pretoria Avenue High Level Bridge to be Commenced Shortly Echoes of the Waterworks Investigation—Current Prices of Material

Correspondence of the Contract Record

April 7th, 1913.

THE amount of permits issued by the building inspector for the first two months of this year aggregate $198,950, and for the corresponding months of 1912 $185,485, being an increase over last year of $13,465.

Everything indicates that the year 1913 will be a record year for construction work in Ottawa, that is to say, if everything runs smoothly—material and labor equalling the demand, etc.

Ottawa Ladies' College

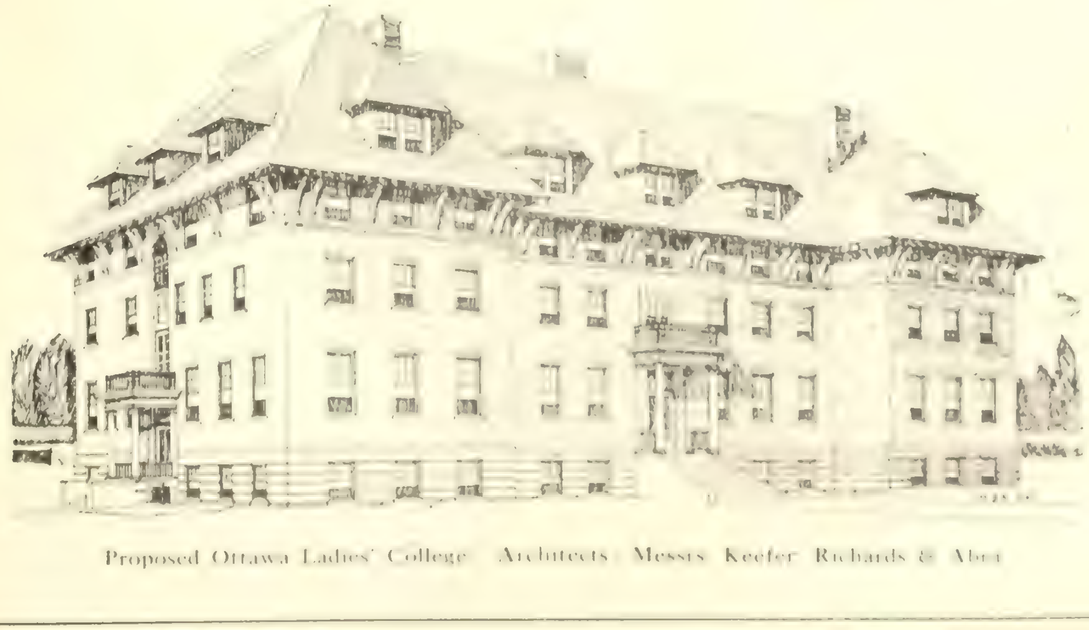
The tenders have now been let for the new Ottawa Ladies' College, to be built at the corner of First avenue and Lyon street, and the construction will be commenced about the first of April. The main building of the new college is 140 feet by 60 feet, with a wing 67 feet by 35 feet. It is of reinforced concrete construction and terra cotta, and will be absolutely fireproof. The roof will be of Spanish Tile. The facing work is of Laprairie rustic brick with limestone trimmings. The ground floor will contain domestic science and chemistry rooms, main dining room with services, kitchen, etc.; it will also contain day pupils' locker room with direct entrance. On the first floor will be reception room and library, administration rooms, along with six class rooms having accommodation for 180 pupils, with a large art room and in the rear an assembly hall with capacity of about 300 persons, which will be augmented to about four hundred by a small gallery on the next floor.

A feature of the building will be the isolation of the piano rooms, these being separated from the assembly hall by a corridor and are insulated with soundproof partitions. The second floor contains the bedrooms of the pupils and teachers, also a well-equipped infirmary. The third floor is also devoted to bedrooms, lavatories, etc.; while the servants' quarters, sewing rooms, etc., are placed in the attic.

The cost of the proposed building and site will be $130,000. Messrs. Keefer, Richards and Abra, 229 Sparks street, Ottawa, are the architects. The contracts were awarded to the following contractors: Masonry, John Robertson & Son; carpentry, A. Richards & Company; painting, W. J. Carson; plastering, Murphy & Morrow; electric wiring, Marchand & Donnelly; plumbing, heating and ventilating, M. M. O'Connell, Limited.

Pretoria Avenue High Level Bridge

The Dominion Government have now granted the city $50,000 towards the cost of the above bridge, and as the plans are all prepared, work will be commenced at an early date. The proposed structure will be erected over the Rideau Canal, and will connect the Glebe district with Ottawa East. It will have five spans—two of 46 feet, 2 of 54 feet and one of 86 feet. The central arch will have a clearance of 30 feet. Two arches will have a clearance of 19 feet and two of 16 feet. The driveway will be continued on each side of the river through the 54 feet arches, and Echo Drive and Elgin



Proposed Ottawa Ladies' College Architects Messrs Keefer Richards & Abra [illegible] will go through the 66 feet ones. The width of the bridge will be 66 feet, made up of roadway 38 feet and two [illegible] sidewalks. The grade to [illegible] street will be 5.2 per cent. and to [illegible] 5 per cent. It will be constructed of reinforced concrete and is designed for heavy highway traffic. The Ottawa Electric Railway will cross to Ottawa East over the new bridge, with a double track. The estimated cost of the bridge is $135,000.

Ottawa Prices of Builders' Materials

(Dealers' prices to contractors delivered on the work)

Brick, kiln run, per thousand	$10.00
Brick, sewer, per thousand	10.00
Brick, chimney, per thousand	14.00
Brick, veneer, per thousand	14.00
Brick, pressed, per thousand	19.00
Brick, enamelled, per thousand	75.00
Brick, sand lime, per thousand	14.00
Blackboard slate, per foot	0.30
Cement, per bbl.	1.75
Coal shutes, each	$8, $10 and $12
Drain pipes (farm) per thousand, 2-in.	9.00
Drain pipes (farm) per thousand, 2½-in.	10.00
Drain pipes (farm) per thousand, 3-in.	13.00
Drain pipes (farm) per thousand, 4-in.	17.50
Drain pipes (farm) per thousand, 5-in.	24.00
Drain pipes (farm) per thousand, 6-in.	32.00
Fire brick, per thousand	32.00
Fire clay, per ton	9.50
Fire lining, 8½-in. by 8½-in., per foot	0.22
Gravel, per yard	1.10
Hardwall plaster, per ton	6.00
Hair (insulator) per 300 sq. ft. ½-in. thick	12.00
Hollow brick, per thousand	14.00
Hollow blocks, per foot, 2-in.	0.05
Hollow blocks, per foot, 3-in.	0.07
Hollow blocks, per foot, 4-in.	0.08
Hollow blocks, per foot, 6-in.	0.10
Hollow blocks, per foot, 8-in.	0.13
Insulating paper, per roll	$2.75 to 3.00
Lath (metal) per yard	10c. to 0.15
Mortar color, per lb.	0.01
Oriental brick, per thousand	30.00
Paper (building), per roll	0.35
Paper (tar), per roll	0.40
Paper (sheathing), per 100 lbs.	1.75
Plaster, per ton	$5 to 6.00
Plaster bead, per foot	0.02½
Plaster board, per foot	0.20
Plaster of Paris, per bbl.	2.25
Roofing felt (2 ply), per roll	3.50
Sewer pipe, 4-in., per foot	0.10
Sewer pipe, 6-in., per foot	0.15
Wall Coping, per lin. foot, 9-in.	0.18
Wall Coping, per lin. foot, 13-in.	0.30

Waste of Water in Ottawa

Acting Waterworks Engineer Storrie has issued a report to the City Council upon the waste of water in Ottawa. The following recommendations of his were passed by the [illegible]:—

1. That the city purchase two pitometer instruments and employ the necessary survey force.

2. That all business premises be metered. This would include meters on all elevators, syphons, beer pumps, booster pumps, etc. That is, every service outside of an ordinary dwelling house should be metered.

3. That all public services be metered, including all buildings, parks, etc. Also that a meter should be placed on all government services.

4. That an efficient force be maintained to carry out a thorough inspection of all plumbing fixtures on all premises and dwelling houses.

5. That detailed plans be made of all the existing mains throughout the entire city.

The consumption of water per capita per day during 1912 was 185 gallons. On February 12th last the consumption reached 206 gallons per capita. It will be seen from this that an enormous amount of water must be running to waste somewhere, and steps will be taken immediately to stop it.

Echoes of Waterworks Investigation

The city of Ottawa will have to face several court cases over the accounts sent in by the various "experts" engaged to help the City Solicitor in the investigation. The Board of Control have made an offer to such of those interested, and if they do not care to accept the amounts they will go to court. Those interested and their claims are:—

	Claim	Offered by City
William Stuart	$3,400.00	$ 900.00
B. Mullin (official stenographer)	4,819.85	2,242.60
C. H. Higgins	500.00	75.00
Cauchon & Haycock (engineers)	6,800.00	4,000.00
Dr. L. Druin	2,000.00	400.00
Dr. Hodgetts	2,000.00	600.00
Dr. Laidlaw	2,200.00	400.00
A. J. McIntyre	792.00	200.00
Dr. Naismith	218.20	158 20
Edith Lawler	75.00	75.00
J. M. Jackson	75.00	75.00
Totals	$22,880.05	$9,125.80

Labor

The Board of Control have passed Acting City Engineer Askwith's recommendation to increase the following wages:—

Derrick runners	30½ cents to 35 cents
Hoistmen	30 cents to 35 cents
Steam roller men	30½ cents to 33 cents
Boiler attendants	25 cents to 28 cents

Municipal Gas Plant

The city is making further inquiries regarding the construction of a gas plant—the controllers and aldermen commenting favorably on the idea.

New Gas Works

Plans have been prepared, and work will be commenced on the buildings in the spring, for the new $500,000 plant for the Ottawa Gas Company. The site of the new works will be on Lees avenue, beside the civic incinerator. The holder building will be 150 feet in diameter and with a capacity of one and a half million cubic feet of gas. The retort house, where the gas is manufactured, will be 150 feet by 50 feet and three storeys high. The exhauster and condenser house will be 104 feet by 48 feet, and two storeys high. All the above structures will have cement bases, solid brick sides, steel windows with wired glass and structural steel frames supporting a roof of reinforced concrete.

The coal sheds will be from 200 to 250 feet long by 61 feet wide, with steel conveyors and carriers extending to all parts of the yard. These will carry the coal to and from the sheds and to the retorts. They will also carry the coke from the retorts to the coke sheds, where it will be automatically loaded into carts for delivery to consumers.

There will be a plant for the extraction and manipulation of tar and ammonia, two by-products of gas manufacture. These will be situated in five or six additional buildings, including a boiler house with brick stack, 120 feet high. The work of laying the thirty-inch main pipe has been commenced and the crossing of the Rideau Canal has been made.

In the crossing of the latter, cofferdams had to be built, and two pumps kept constantly at work clearing the water from the bed of the canal.

Commercial Buildings Contemplated

Queen street, the first one from Sparks street, will be the next in Ottawa to have skyscrapers. The Wallace Realty Company are having plans prepared for a ten-storey steel building to be situated at the corner of Queen and Elgin streets. On the same street will be built the new eight-storey building of the Ottawa Evening Journal, costing over a hundred thousand dollars. Mr. A. LeB. Weeks is the architect. Mr. R. W. Stephen will also build on Queen street a five-storey steel and concrete building. Several other large buildings are contemplated for this street.

The Ottawa Electric Railway will place a double track on Queen street this year,—between Elgin and Bank streets.

The American Bank Note Company have had Mr. J. Albert Ewart, of Ottawa, prepare plans for an addition to their premises, which will cost over $100,000, and will be of fireproof construction throughout. The structure will be erected on Wellington street.

New Churches for Ottawa

Four new churches are going ahead this year in Ottawa, a Methodist Church in the Glebe district, Mr. C. J. Burritt, architect; a Presbyterian Church in Ottawa South, and a Baptist and a Presbyterian Church in Westboro. The Methodist church in the Glebe district will cost about $150,000, and will be erected on Lyon street, between Second and Third avenues, on a block of land 206 feet by 219 feet.

Canadian Railroad Development

There would appear to be inadequate appreciation of the operation now under way or shortly to be undertaken by the Canadian Pacific Railway in improving its existing lines and making extensions, and the far-reaching effect these works will have in improving transportation facilities to the West. A five and a half mile tunnel to be constructed at Rogers' Pass, the scene of some disastrous landslides, is but the precursor of a sixteen mile tunnel at Kicking Horse Pass. At the latter point the C. P. R. had originally a four and a half per cent. grade, which, after twenty years of operation, was reduced to a two and a half per cent. grade about five years ago. When the projected tunnel is built the grade will be but one per cent., and the route will be shortened by five miles. The tunnel will be the longest in America. Experiments and investigations by engineers indicate that the C. P. R. is shortly to adopt electricity as its motive power for traffic on its mountain section, at a cost which will be about one-third of the fuel now used. In addition to the double-tracking work which will give the C. P. R. two parallel tracks from Montreal to Vancouver within a measurable time, an entirely distinct line from Winnipeg to Vancouver, via the railways now under construction through the Kootenay and Okonagan Valleys, will give the C. P. R. three tracks through the Canadian West. The Soo line, which is closely affiliated with the C. P. R., will soon have a track from Chicago to Spokane, whence it will run over a Harriman line into Portland, making still another C. P. R. connection with the Pacific Coast. When the projected tunnels and double-tracking are completed, the C. P. R. will have a line between the Great Lakes and the Pacific Coast which will be 300 miles shorter than any other transcontinental route, while it will also have more favorable grades and curvature than any United States road.

It is estimated that during last year about ten millions of dollars were spent by the C. P. R. bridge department on new and old structures and a very large amount of bridge work is still in progress and proposed, exclusive of the extensive constructions that will be required soon for the proposed abolition of grade crossings. The magnitude of the bridge work is indicated by the following summary taken from the report of Mr. P. B. Motley for the year ended June 30, 1912; At the end of the fiscal year there were in existence 3,771 bridges and open culverts. These had an aggregate length of 68.69 miles. There were 25,125 culverts other than open, of which 14,032 were permanent and 11,093 of a temporary nature. During the year 778 old bridges and open culverts were replaced, aggregating 39,402 lineal feet, including 24 old iron and steel bridges, too light for present traffic and having a total length of 2,438 feet. There were 923 culverts other than open and overhead bridges replaced. New bridges to the number of 109, aggregating 2.3 miles were added. The number of temporary bridges were reduced during the year by 629, aggregating 3.89 miles.

One of the finest stretches of rock ballasting on the entire C. P. R. system is the sixty-five miles which has been completed east from Vancouver. The work has been pronounced by railway experts to be second to none on the North American continent. The ballast, which is crushed rock from the C. P. R. rock crushing plant at Nicomen, is placed in the centre of the track and on the ties by centre-dumping hopper-bottom cars. The track is then lifted and the rock ballast stamped into place between the ties. The crushed rock under the ties averages from eight to ten inches in thickness. This type of ballast is ideal for a wet climate, as it is readily drained and easily maintained in good line and surface. Experts declare that this kind of ballasting increases the comfort of the travelling greatly. Miles of crushed rock ballasting is being laid on the C. P. R. For twenty-four miles out of Vancouver the main line of the C. P. R. is double-tracked and in operation. Sixty miles of double track construction work is in progress now, and of this twenty-five miles from New Westminster Junction to Mission will be completed by May 1. The remainder of the distance from Mission Junction to Ruby Creek will be finished by the early fall. When double track work is completed and the line ballasted with crushed rock, there will be no finer piece of rail line in the country.

The steel which is being laid on the Grand Trunk Pacific Railway from Tofield to Calgary, a distance of about 200 [illegible] latter city. Previously the steel gang and outfit cars had been stationed at Hubalta, some six miles east of Calgary, but will now be taken back to Irricana where a gravel pit will be opened and ballast laid along the tracks as far as the river. The Dominion Bridge and Steel Company will at once commence to erect the large steel bridge over the Bow which will, it is expected, take about four or five weeks to complete. The G .T. P. survey staff under Mr. L. J. Devereux, resident engineer of Tofield, are now surveying between the river and the city. A temporary station will be erected immediately and other terminal facilities will follow as soon as possible. In about three weeks' time work will be started on [illegible] of farming country. There is already some 40 miles of steel, laid on this line last summer. This portion will, it is understood, be ballasted immediately so as to allow passenger and [illegible]

Work on the new court house at Humboldt, Sask., will soon be commenced. The cost of this building will be $50,[illegible] works this year

Mainly Constructional

The News in Brief—From Coast to Coast

The Whonnock Brick & Tile Company, Limited, Vancouver, has been incorporated, with a capital of $50,000.

The Montreal Board of Control propose to lay down approximately [illegible] miles of new paving this season. Last season 13.5 miles of streets were paved.

Fort Saskatchewan is to have a new Central Prison at a cost of $200,000. The plans have been prepared by Mr. Richard Blakey, the Provincial Architect.

The Dominion Bridge Company, Limited, has taken out an extra-provincial license for British Columbia. The head office for the province will be located at Vancouver.

Mr. J. C. M. Keith, of Victoria, has been entrusted with the preparation of plans for the proposed Christ Church Cathedral. The sum of $400,000 has been named for building purposes.

The Canadian British Engineering Company, Limited, whose head office is at 4 Queen Victoria street, London, Eng., has registered in British Columbia, in which province it will establish an office at 847 Beatty street.

The building permits issued at Toronto from January 1 to March 31, 1913, totalled $4,891,579, compared with $3,665,830 for the corresponding period of 1912. The March figures were $2,066,285 and $1,557,750 respectively. The increase per cent. for the first quarter of 1913 is 33.

St. John, N.B., is making remarkable strides in the construction field, and in building no less than in any other department. The total for the first quarter of 1913 shows a noteworthy increase over the corresponding period of 1912. The figures are $1,002,000 and $50,950 respectively.

Mr. Wm Young, the Controller of Water Rights Works in British Columbia, has written to McGill University stating that a number of parties are being sent out this season, and that several graduates in civil engineering are required as assistants. The positions referred to are in connection with the irrigation and power investigation in that province.

Montreal is left far behind by Toronto in the building records to date. During the first three months of the current year the building permits in the former city represented an expenditure of $1,867,847, compared with the Queen City's total of $4,891,579. Last year, during the first quarter, Montreal's figures were $1,421,159, so that in spite of the comparison the commercial metropolis has a percentage of increase of 31, which must also be compared with Toronto's 33.

There is noteworthy activity this year in the Department of Works at Toronto. During 1913 sewer construction alone will aggregate $4,000,000 in cost, while the road work will involve another $1,000,000. Contracts for sewers, costing $500,000, have been let to date. The Department has had, on an average, 650 men employed on sewer work alone during the last few weeks. From the first of January to date, paving contracts have been let to the extent of $208,000.

A deputation composed of the representatives of all the municipalities, chambers of commerce, as well as the boards of trade and other public bodies of the districts of Montreal and Toronto, waited on the Minister of Public Works, at Ottawa, in connection with the proposed Montreal-Toronto highway and the construction of a bridge on Ile Perrot. The importance of the road was pointed out, and the Minister, while promising to present a good roads bill, said the great obstacle was the opposition of the Senate.

It has been decided to form a Fire Prevention Committee in Montreal. The object will be to obtain and enforce such regulations as will prevent the waste of property by fire. It was pointed out that the present building regulations are very lax and that scant provision is made for the inspection of new and re-modelled buildings. Many representatives of business organizations were present, including those of the Builders' Exchange, Architects' Association of the Province of Quebec, Manufacturers' Association, and Board of Trade.

The Albion Motor Car Company, Limited, of Glasgow, Scotland, claimed to be the largest manufacturers of motor trucks in the British Empire, realizing the opportunities offered by Canada, have organized the Albion Motor Car Company of Canada for selling and maintaining these trucks in this country. The company's main office is in the St. Nicholas Building, at Montreal, where there are four Albion trucks for demonstrating purposes. Over sixty trucks of the Albion make are now running in Canada. The company recently received the only order yet placed by the Canadian Pacific Railway. Albion trucks are built in capacities of 1,200 pounds to 5 tons, with bodies to suit any business. The company's Toronto service station is located at 112-116 Richmond street west, and is in charge of Mr. Jno. Wilson, formerly with the Albion Company, at Glasgow, Scotland.

Personal Mention

Mr. Angus Smith, City Engineer of North Vancouver, B.C., is resigning at the end of April.

Mr. W. J. Weller has been appointed superintendent of bridge construction for the C. N. R. in British Columbia.

Mr. Roger P. Strickland is located at Saskatoon, Sask., as president of the Saskatoon Supply Company, Limited.

Mr. Edmund A. Pratt, of the engineering staff of the Trussed Concrete Supply Company, is located at Bombay, India.

Mr. T. L. Kennedy, Chairman of the Toronto-Hamilton Permanent Highway Committee, was presented with an engraved gold watch and address last week in appreciation of his services.

The engineering practice of Mr. W. H. Breithaupt and the late Mr. E. H. Keating will be conducted by Mr. Breithaupt, who has associated with him Mr. Chas. B. Kingsley. The firm's office is at 82 King street east, Toronto.

Publications Received

Iron and Steel, by O. F. Hudson, Lecturer on Metallography, Birmingham University, and Guy D. Bengough, Lecturer in Metallurgy, Liverpool University; an introductory text-book for engineers and metallurgists; Constable & Company, Limited, Leicester Square, London. A brief treatise embodying the more important principles of the metallurgy of iron and steel. Careful explanation is given as to the constitution of steel and cast iron, and the effect of mechanical and heat treatment on the properties of these alloys. The subject of corrosion is dealt with in special section by Dr. Bengough, the editor of the series.

A remarkably fine series of architectural photographs has been collected by Frank Cousins and published under the title of "Fifty Salem Doorways," by Messrs. Doubleday, Page & Company, Garden City, N.Y. There is an interesting introduction by Mr. Glenn Brown, F.A.I.A., in which architectural developments are traced and the various influences established and explained. Mr. Cousins who is a native of Salem, commenced taking photographs of architectural subjects there in 1888, and his enthusiasm was so aroused that for years he has devoted his whole time to the subject. Mr. Glenn Brown pays with a warm tribute to Mr. Cousin's contribution to works on colonial architecture.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Aylmer, Que.
The town contemplates installing an underground meter service. Mayor, W. G. Mulligan. Engineer-in-charge, Mr. Leblanc, town engineer.

Edmonton, Alta.
Water mains. Clerk, C. Cox. Engineer, A. J. Latornel. Tenders received by City Commrs. till April 23rd. To provide material, excavate and lay 60,036 lin. ft. 6 in., 10,200 lin. ft. 8 in., 11,260 lin. ft. 10 in., 3,705 lin. ft. 12 in., 3,450 lin. ft. 14 in., 1,220 lin. ft. 16 in., 2,150 lin. ft. 20 in., cast iron pipe. Plans, specifications, etc., at office of Engineer.

Kingston, Ont.
Block pavements planned by city council. Mayor, T. J. Rigney. Engineer, R. J. McClelland, will shortly call for tenders for the laying of nearly a mile of pavements on down town streets.

Lindsay, Ont.
Pavements. Tenders received by chairman Board of Works, Richard Kylie, until April 21st, for approximately 25,000 square yards. Tenderers to specify material.

Mooes Jaw, Sask.
Glazed tile pipe. Tenders received till noon April 30th, 1913, by City Commissioners, W. F. Heal, Jas. Pascoe and L. W. Rundlett, for 1,500 ft. 20 in. pipe, 2,000 ft. 18 in. pipe, 2,800 ft. 15 in. pipe, 900 ft. 12 in. pipe, 2,800 ft. 10 in. pipe, 23,000 ft. 8 in. pipe, 40,000 ft. 6 in. pipe, 1,200 ft. 4 in. pipe, 26 ft. 6 in. off 20 in. tees, 90 ft. 6 in. off 18 in. tees, 50 ft. 6 in. off 15 in. tees, 15 ft. 6 in. off 15 in.-y's, 20 ft. 6 in. off 12 in. tees, 10 ft. 6 in. off 12 in. y's, 350 ft. 6 in. of 10 in. tees, 200 ft. 6 in. off 10 in. y's, 500 ft. 6 in. off 8 in. tees, 400 ft. 6 in. off 8 in. y's, 6 ft. 4 in. off 18 in. tees, 5 ft. 4 in. off 15 in. tees, 15 ft. 4 in. off 10 in. tees, 45 ft. 4 in. off 8 in. tees, 125 4 in. elbows, 12 pieces 20 in. channel pipe, 6 pieces 18 in. channel pipe, 20 pieces 15 in. channel pipe, 8 pieces 12 in. channel pipe, 40 pieces 10 in. channel pipe, 85 pieces 8 in. channel pipe, 850 4 in. to 6 in. increasers, 800 6 in. ⅛ bends. All pipes and specials must be first class glazed tile. All pipe and specials over 12 in. to be of double strength. Time of delivery must be stated. J. Antonisen, engineer.

Manhole frames and covers. Engineer, J. Antonisen. Tenders received by City Commissioners till April 30th, 1913, for 160 valve chamber frames and covers, 100 manhole frames and covers. Time of delivery must be stated. Plans, specifications, etc., at office of Engineer.

Valves and hydrants. Tenders received by Commissioners till April 30th, for 65 6 in. hydrants with turn buckle spindle, 2 2½ in. connections and 1-3 in. steamer connection. All connections to have 7 threads to the inch. Frost cases must be provided and have a depth of 8 ft. 2 in. The top of the main valve stem shall fit a 1½ in. triangular key and turn to the left to open, 86-6 in. gate valves and spindles, 50-8 in. gate valves and spindles, 10-10 in. gate valves and spindles, 35-12 in. gate valves and spindles. Drawings and specifications must be submitted by tenderer. Time of delivery must be stated. J. Antonisen, engineer.

Ottawa, Ont.
Mayor, J. A. Ellis. Acting waterworks engineer, Wm. Storrie, A.M.I.C.E. Sinking of 3 to 5 wells throughout the city, is contemplated at a cost of $20,000.

Sarnia, Ont.
Council contemplates paving Front street with brick or cement. Cost, $4,000. Address, Mayor, Dr. Bell.

Sealed tenders received up April 28th for the supply of material and the construction of: Contract "A"—Labor laying approximately 11,700 feet of 24 inch force main. Contract "B"—Furnishing all material for and constructing pumping station. Contract "C"—Furnishing all material for and constructing infiltration basin and sluiceway. Copies of plans etc., may be seen at the office of H. A. McLean Town Engineer, Sarnia, or at the office of Chipman & Power, Engineers, Toronto. No tenders necessarily accepted. Dr. J. A. Bell (Mayor), Dr. W. A. Henderson, Chairman Fire and Water Committee. Address, J. D. Stewart, Esq., Town Clerk.

Simcoe, Ont.
Sewerage system, cost $66,000. Mayor, L. C. Gibson. Engineers, Chipman & Power, Mail Bldg., Toronto. Tenders received by Clerk, W. C. McCall, up to April 23rd, for: (a) laying main sewer and sewage force main; (d) furnishing cast iron pipes; (g) sewage pumping machinery; (p) sewage pumping station; (s) tile sewer pipes; (x) sewage disposal works. Plans, specifications, etc., at office of engineers, Toronto, and at Town Hall, Simcoe.

Toronto, Ont.
Pavements and sewers. The Board of Control [illegible] miles of sewer. Mayor, H. C. Hocken.

Windsor, Ont.
[illegible] Howard Ave. [illegible] charge of arrangements.

Winnipeg, Man.
Sewer [illegible] planned by Board of Control. Engineer, H. N. Ruttan, 223 James avenue. Sewer pumping station at corner of McPhillips and Aberdeen avenue. Plans, specifications, etc., at office of Engineer. Tenders received by Secretary, M. Peterson, until April 17th.

Tenders received by Engineer for construction of sub-main on Bruce street from Conway street to Berlin street through Deer Lodge, Sub-div. Deer Lodge Park, Ravenswood and Oakdale Park. Sec.-Treas., Frank Ness, Kirkfield Park, P.O.

Meter fittings. Tenders received by Secretary, M. Peterson, until April 21st, 1913, for 4,000 galv. reducing couplings ¾ in. x ½ in., 2,500 galv. unions ½ in. 2,500 galv. elbows ½ in., 3,000 galv. street elbows ½ in., 1,000 galv. couplings ½ in., 500 galv. nipples 1½ in. x ½ in., 3,000 galv. nipples 8 in. x ½ in., 1,000 galv. nipples 6 in. x ½ in. Specifications, etc., at office of Engineer. H. N. Ruttan, 223 James avenue, Engineer.

2,500 water meters for domestic water service system required. Specifications, etc., at office of Engineer. Tenders received by Secretary, M. Peterson, until April 28. Engineer, H. N. Ruttan, 223 James avenue.

Sewers and watermain. Engineer, H. N. Ruttan, 223 James ave. Contract awarded to J. W. Astley, Engineer of Construction, City Yards, for sewers in Wilton, Hugo, Lilac, Weatherdon, Sinclair, Saskatchewan, McCalman, Union, Helen and Midland streets and watermain in Roy and Albany streets. To Thos. Jackson & Sons, 370 Colony St., for sewers in McGregor, Richard, Strathcona and Grey streets. To Thos. Kelly & Sons, 200 Nanton Bldg., for sewers in Manitoba, St. John and Church streets. To Dominion Construction Co., 290 Selkirk ave., for sewers in Thames and St. [illegible]

CONTRACTS AWARDED

Ottawa, Ont.
Sedimentation basin, cost $17,000, Lemieux Island. Mayor, J. A. Ellis. Acting waterworks engineer, Wm. Storrie, A.M.I.C.E. Work being done by day labor. Piping, etc., necessary.

Wninipeg, Man.
Reservoir, Logan avenue. General contractors for reinforced steel, The Steel Company of Canada, [illegible] Union Bank Building, at $27,116.65, and for 25,000 bbl. cement to The Canada Cement Company, Limited, 910 McArthur Bldg., at [illegible] per bbl. Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James avenue.

Windsor, Ont.
Cast iron water pipe awarded by Water Commissioners, [illegible] tons at [illegible] per ton. Secretary, W. A. Hanrahan, Room 3, City Hall. Chairman Water Commissioners, J. F. Smyth. General contractors, [illegible] Philadelphia, Pa.

Railroads, Bridges and Wharves

Province of Alta.

The Calgary & Edmonton Ry. Co. has been directed to construct spur for the Saskatchewan Land & Homesteading Company, Limited, from a point on its railway in Sec. [illegible] W. 4 M. Alta.

Burford Twp., Ont.

Bridge, planned by Twp. Council. Reeve, F. W. Taylor, Cathcart. Engineer-in-charge, Mr. Jackson, Brantford. One span, 70 x 14, cement substructure, steel superstructure.

Greenfield Park, Que.

Railway. Montreal & Southern Counties Railway Co. has been authorized to construct across 18 highways in Parish of St. Antoine de Longueuil, Town of [illegible] Que.

Islington, Ont.

Canadian Pacific Railway Company has been authorized to construct spur for the Dominion Bridge Co., Ltd.

Kincardine, Ont.

Extension to dock, cost $25,000, contemplated by Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Timber, cement, stones and gravel required. Plans will be prepared.

Kingston, Ont.

Conduits are to be laid in about 7 blocks as all poles and wires are to be placed underground. Tenders will be called. Mayor, T. J. Rigney. Engineer, R. J. McClelland.

Kaslo, B.C.

Tenders received by Secretary, R. C. Desrochers, until May 6, for construction of pile bent, timber decking, wharf 432 ft. long and 32 ft. wide. Plans, specifications, etc., at Department and at office of F. W. Aylmer, District Engineer, Chase, B.C., C. C. Worsfield, District Engineer, New Westminster, and Postmaster. Dominion Government, Department of Public Works.

Moose Jaw, Sask.

C. P. Rly. Co. has been authorized to construct spur for Messrs. Wm. Hodge & Hugh Rorison.

Lytton, B.C.

Bridge. Tenders received by Minister until noon, May 7, 1913, for (a) Substructure and erection of superstructure; (b) manufacture and delivery of steel for superstructure. Plans, etc., may be seen at offices of government agents at Ashcroft, New Westminster, Vancouver, and Engineer, J. E. Griffith, Victoria. Prov. Government, Dept. of Public Works. Minister, Hon. Thos. Taylor, Victoria, B.C.

Moricetown, B.C.

Station. Grand Trunk Pacific Railway Company's location of station at Moricetown, mileage 204.6, Prince Rupert East, in Cor Ya Tsa Qua Indian Reserve No. 2 Cassiar Dist. B. C.

Ottawa, Ont.

Fenelon Falls dam. Tenders received by Secretary, L. K. Jones, Ottawa, Dom. Govt. Dept. of Railways and Canals, until May 1st. Plans, etc., at office of Chief Engineer of Dept., at Ottawa, and Supt. Engineer, Peterboro, Ont.

Sea-going tug for Dominion Government, Dept. of Railways and Canals. Secretary, L. K. Jones, Ottawa. Tenders received by Secretary up to April 10th. Length, 70 ft.; beam 16 ft.; draft 6 ft.; displacement 100 tons; speed 10 to 12 knots per hour. Further information from above Department.

Steel tug boat, Dominion Government, Dept. of Railways and Canals. Tenders received by Secretary, L. K. Jones, Ottawa, up to April 16th. Plans, specifications, etc., at office of City Engineer, Department, Ottawa, Supt. Engineer, Quebec Canals, New Birks Bldg., Montreal, Intercolonial Railway Agent, 7 Du Fort street, Quebec Intercolonial Railway Ticket Office, St. John, N.B., W. M. Everall, Pres., Inspecting Engineer, Port Arthur, Intercolonial Railway Agent, 51 King street east, Toronto.

Perth, N.B.

C. P. Rly. Co. has been authorized to construct bridge No. 100.5 on Woodstock Sub. Div. over St. John River, at Perth, N.B.

Prince Albert, Sask.

Canadian Northern Railway Company has been authorized to construct spur for the Imperial Oil Co., Ltd.

Saskatoon, Sask.

Tenders received by City Commissioners till noon April 24th. For double tracking certain streets of street railway. Plans, specifications, etc., at office of Superintendent. Chairman, Mayor F. E. Harrison. Supt. of Rly., E. Hanson.

Strathclair, Man.

Bridge, planned by town council. Clerk, J. D. Coghlin. Contractor to supply all material. Plans, specifications, etc., at office of Clerk, who will receive tenders till April 29th, for construction of bridge over the Little Saskatchewan River on Section 20, Twp. 17, Range 21.

CONTRACTS AWARDED

East River, N.S.

Lock, dam, etc., cost $390,700. Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, McDougall Bros., Ottawa, Ont.

Glen Allen, Ont.

Bridge, cost $8,707. Engineers, Bowman & Connor, 36 Toronto Street, Toronto. General contractors, Hamilton Bridge Co., Hamilton. 159 ft. centre to centre steel bridge to be erected on old abutments, 17 ft. roadway.

Province of Ont.

Stations, cost $300,000, planned by National Transcontinental Rly. General contractors, Crockett & Tharle, 14 Murray Block, Ft. William. 45 stations between Superior Junction and Fowke, Ont., some buildings to be of brick and some of frame construction.

Vancouver, B.C.

Bridge, cost $67,000, for C. P. R. General contractors, Westinghouse, Church, Kerr & Company, 837 Hastings west. Structural steel construction. To be erected over railway tracks connecting Burrard street and wharves.

Wakefield, N.B., Co. of Carleton

Arch culvert, cost $3,000. General contractor, William D. Steeves, Woodstock, N.B. "Doherty Brook" arch culcert.

Public Building, Churches, Schools, etc.

Barrie, Ont.

Addition to Registry Office planned by County Council of Simcoe. Chairman of Property Committee, E. T. McConkey, Barclay, Ont. Architects, Edwards & Saunders, 18 Toronto street, Toronto. Plans in Treasurer's office, Barrie, and office of architect. Tenders received by Chairman until noon, April 18th, for masonry, carpentry, slating, plumbing, heating, etc. Brick construction and foundation.

Berlin, Ont.

Church for St. Matthew's Lutheran Congregation. Site purchased, frontage 127 feet and plans will be prepared.

Bracebridge, Ont.

Public building. Tenders received until April 28 by R. C. Desrochers, Secretary, Department of Public Works, Ottawa. Plans, etc., at office of Thos. Hastings, Clerk of Works, Postal Station F, Yonge street, Toronto, and at this Department. Cheque for 10 per cent. of amount must accompany each tender.

Estevan, Sask.

Armory, cost $20,000, contemplated by Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. To be erected for the 20th Border Horse. Plans prepared.

Gananoque, Ont.

Extension to Parish House contemplated by the Church of England. Vestry Clerk, C. V. Ketchum. Plans will be prepared.

Guelph, Ont.

Alterations and addition to college, contemplated by Jesuit Fathers (Father Doyle). Architect, W. A. Mahoney, Telephone Building. Tenders will be called shortly.

Hamilton, Ont.

School, cost $40,000, planned by Separate School Board. Chairman, J. Reding Commercial Chambers, James street. Architect, Robt. Clochey, 226 John street south. Tenders called. Two storeys, 94 x 74.

Kingston, Ont.

Barracks, cost $20,000, Princess, for Salvation Army. Architect, Major Miller, 20 Albert street, Toronto. Plans being altered, new tenders to be called. Two storeys, 40 x 60, brick, stone foundation.

London, Ont.

Sunday school, cost $20,000, for Centennial Methodist Church. Pastor, Rev. H. S. Graham, 850 Dundas street. Supt., Wm. Jeffrey. Tenders will be called shortly. Two storeys, brick construction.

Matane, Que.

Public building. Tenders will be received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until May 5th. Plans, specifications, etc., at office of R. L. Deschamps, 103 St. Francois Xavier street, Montreal Post Office, Matane, and Dept., Ottawa. Specifications also at office of MacLean Daily Reports, Toronto.

Montreal, Que.

Church, cost $30,000, for Lower Level M. E. Church. Chairman Building Committee, I. T. Snyder. Architect, Badgley & Nicklas, 6110 Euclid avenue, Cleveland Ohio. One storey and basement, brick and structural iron construction, stone trimmings. Preliminary plans in progress.

Oxford Centre, Ont.

School, cost $6,000. Secretary, Conrad

Sipple, Rural Route No. 2, Tavistock, Ont. Architect, J. S. Russell, 21 Downie street, Stratford, Ont. One storey, 40 x 40, stone foundation, pressed brick construction. Plans in progress.

Portage La Prairie, Man.

Masonic temple, cost $16,000. Architect, Frank R. Evans, 506 Somerset Bldg., Winnipeg. Two storeys, 35 x 90, stone and cement foundation, structural steel, stone, artificial stone and pressed brick construction. Tenders will be called.

Toronto, Ont.

Day school, 385 Brunswick ave., contemplated by Loretta Abbey, Mother House, Wellington street west. Site has been purchased, and plans will be prepared.

Tilbury, Ont.

Fire and town hall, cost $10,000, contemplated by the town council. Mayor, Dr. Sharp, Councillor, Clark. Stone and cement foundation, brick construction. Plans will be prepared.

Toronto, Ont.

Theatre, cost $5,000, for M. Young, Queen street east. Architects, Mallory & Thatcher, 31 Queen west. Two stys., 25 x 110, brick foundation, structural steel and brick construction. Plans drawn.

Court House, cost $20,000, planned by Provincial Government, Dept. of Public Works. Secretary, H. F. McNaughton, Parliament Bldgs. Above amount included in estimates for building for Rainy River district.

Theatre, cost $6,500, Bloor and Ossington, for W. H. C. Summerfeldt, Bloor & Gladstone. Architect, J. Hunt Stanford, Bloor and Ossington. Two storeys, 48 x 122, structural steel and brick construction, brick foundation. Plans drawn.

Theatre, Victoria and Richmond, contemplated for C. H. Miles & Company, New York City. Site purchased. Plans will be prepared.

Trenton, Ont.

Armory, contemplated by Dom. Govt. Dept. of Militia and Defence. Secretary, E. F. Jarvis, Ottawa. Ratepayers passed by-law granting $35,000 for site.

Winnipeg, Man.

School, contemplated for Rural Municipality of Assiniboia. Secretary Frank Ness, Kirkfield Park, P.O. Architect, A. Melville, 405 Builders' Exchange, Winnipeg. Three storeys, 135 x 85. New by-law will be submitted on May 3rd, 1913

Windsor, Ont.

Addition to All Saints Church, cost $6,000, Windsor ave. Pastor, Rev. A. Carlisle. Tenders received by architects, Leybourne & Whitney, Davis Bldg., from April 18th to 25th. Chairman of Board, Capt. W. J. Willoughby, 142 Dougal ave. Basement to be equipped with gymnasium. Two storeys, 45 x 50, brick construction and foundation.

CONTRACTS AWARDED

Calgary, Alta.

Police signal [illegible] planned by City Council. Clerk, J. M Miller. General contractors, the Northern Electric & Mfg. Co.

Ottawa, Ont.

Addition to church, cost [illegible] Notre Dame de Lourdes, Eastview. General contractor, Daoust Belanger, at church, Eastview. Stone foundation, stone construction.

Toronto, Ont.

Theatre, cost $10,000, for N. Gold, 101 Queen west. General contractors, Strathy & Company, Limited, 123 Simcoe street. Brick construction and foundation.

Vancouver, B.C.

Sunday School Bldg., cost $30,000, Larch and 2nd ave., for Kitsilano Methodist Church. Architect, Thos. Hooper, 739 Hastings street west. General contractor, S. Olson, 109 44th ave. west. 51 x 76, reinforced concrete cut stone and brick construction. Church building to cost $100,000, will be erected later.

Winnipeg, Man.

Club house, for The Winnipeg Beach Club. Secretary, Vernon Morris, 113 Cauchon street. Architects, Hooper & Hooper, 303 McIntyre Building. Work will be done by day labor under supervision of Mr. Jardine who will purchase all material.

Business Buildings and Industrial Plants

Belleisle, N.S.

Apple warehouse, cost $3,000, Anna Co., for a co-operative fruit company. Promoter, Wm. Bent. 1½ storeys, 85 x 40, concrete foundation, wood construction, metal roofing. Plans in progress.

Camrose, Alta.

Hotel, cost $100,000, near C. P. R. station, for Reno Lemarchand, 395 10th st., Edmonton. Plans will be prepared.

Forest, Ont.

Greenhouses, cost $3,000, to be erected. E. A. Rawlings will prepare plans at once. Equipment required.

Ft. William, Ont.

Stores and warehouse, cost $20,000, for Phil. Drapkin, 12 Bethune Place. Architect, R. E. Mason. Four storeys, 25 x 100, common pressed brick construction, cement foundation. Plans in progress.

Gananoque, Ont.

Paper box factory planned by the Booth Felt Co., Ltd. To be combined with manufacture of felt.

Hamilton, Ont.

Warehouse, cost $10,000, Caroline north, for Hamilton Importing Company, King William. Architects, Watt and Blackwell, Lister Chambers. Five stys., cement foundation, reinforced concrete construction. Tenders called.

Montreal, Que.

[illegible] Augustin, for O. Lamoureux, La Patrie Building, St. Catherine street. Architect, [illegible] tion, pressed brick construction, roofing. Plans drawn.

New Westminster, B. C.

[illegible] J. F. Watson, New Westminster Trust Building. [illegible] erected on 8th street, between Carnarvon and [illegible]

Ottawa, Ont.

Coal sheds, cost $20,000, Market, for [illegible] St. Fireproof construction. Plans will be prepared.

Printing plant, cost $40,000, for Lowe-Martin Printing Company Company, Albert street. Five-storeys, fireproof construction, area of 5,600 sq. ft. Plans in progress.

Addition to factory, cost $25,000, for Campbell Steel & Iron Works, Carling avenue. Solid brick and structural steel construction, cement foundation, concrete floors. Plans in progress.

Scotstown, Que.

A company is being organized who plan to erect a chair factory. M. G. Scott is interested.

Prince Albert, Sask.

Oil warehouse, cost $12,000, for the Imperial Oil Co., 16th street west. Architects, Creighton & Crowther, K. C. Bldg. Two storeys, brick foundation, structural steel and brick construction. Plans prepared.

St. Thomas, Ont.

Addition to store, cost $5,200, for R. H. & J. Dowler, 489 Talbot street. Two storeys, white brick construction, stone and cement foundation.

Toronto, Ont.

Four attached stores and residences, cost $15,000, Queen east, for J. E. Wainwright, 621 Crawford. Architect, J. G. Hedges, 210 Clinton street. Three stys., 21 x 50 each, brick foundation, structural steel and brick construction. Plans drawn.

Warehouse, cost $11,000, for A. Humphrey, 364 Queen west. Architects, Mallory & Thatcher, 31 Queen west. Three storeys, 28 x 56, structural steel and brick construction, cement and brick foundation. Plans drawn.

Store and residence, cost $6,000, Dundas street, for I. Burger, 161 Maria. Architect, Leonard Foulds, 2 Leader lane. 2½-storeys, structural steel and brick construction, brick foundation. Plans drawn.

Garage, cost $3,000, Lippincott, for J. M. Cowan (in trust), 65 Adelaide east. One storey, 22 x 91, brick foundation, structural steel and brick construction, felt and gravel roofing. Plans drawn.

10 stores and apartments, cost $35,000, College, for Marks & Cohen, 414 Spadina avenue. Building superintendent, Wm. Griffiths. Masons, J. Redwood & Son, 9 Howard Park avenue. Carpenter, owner. (4 stores trimming). Excavating for balance. Tenders received by Building Superintendent for roofing, painting, heating, plumbing and electrical work.

Alterations to store, cost $3,500, for Hennesey Drug Stores Ltd., 107 Yonge street. Architect, Chas. Hunter, care owner. Three storeys, brick construction, cement and brick foundation. Plans drawn.

Three attached stores and residences, cost $8,000, for Thos. Jones, Dundas St. Architect, F. A. Fleming, 94 Laws St. 2½ storeys, 15 x 52, stone foundation, [illegible] Plans drawn.

Alterations to warehouse, cost $5,000 [illegible] King and Leader Lane. Brick found[illegible] tion

[illegible]

of Public Works. Secretary, H. F. Mc-[illegible] Above amount [illegible] in estimates for building [illegible]

Office building contemplated for Ontario Hydro-electric Power Commission, Continental Life Bldg. Site not yet selected. Plans in progress.

Victoria, B.C.

Bank building, Government and Langley streets, for the Bank of Montreal. Architect, A. A. Cox, 199 Hastings street west, Vancouver. One storey, 60 x 132. Plans in progress.

Westboro, Ont.

Store and residence, cost $6,000, for George Watson, Main street. Stone foundation, brick veneer construction. Plans in progress.

Store, cost $3,000, for R. S. Law, Main street. Cement foundation, brick veneer construction. Plans in progress.

Windsor, Ont.

Bank, store and flats, cost $11,000, Wyandotte, for A. J. Campeau. Tenders received by architects, G. Jacques & Co., Boug Building, until April 20th. 2-stys., 50 x 60, pressed brick front, cement fndn.

Winnipeg, Man.

Alterations to store, cost $3,000, for F. W. Woolworth Co., Portage avenue. Plans drawn by Mr. Whitmore, of F. W. Woolworth Co.

Warehouse and mill, cost $4,000, St. James street, for Dominion Gypsum Co., 107 McArthur Bldg. Architect care owner. One storey, 50 x 90, structural steel and sheet metal construction. Plans drawn.

Warehouse, cost $10,000, Pacific ave., for Crane & Ordway, 93 Lombard street. Architect, J. H. G. Russell, 1110 McArthur Bldg. One storey and basement. Tenders will be received by owner for superstructure.

Market contemplated by the Million for Manitoba League, care Industrial Bureau. Architect, P. C. Samwell, 516 Builders' Exchange. Two storeys, 150 x 50, concrete foundation, frame construction. Work to be done by day labor or let separately. Plans in progress.

CONTRACTS AWARDED

Brantford, Ont.

Office and warehouse, cost $10,000, W. Mill street, for The Slingsby Mfg. Co., (Woolen Mills). Secretary, Jno. R. Varey. Architect, L. D. Barber, Temple Bldg., Dalhousie street. General contractor, owner. Mason, Jno. Richards. Carpentry, Jago & Coles. Painting, plumbing and interior fittings not let. 3 storeys and basement, 50 x 50, cement foundation, sand lime and Hamilton pressed brick construction.

Calgary, Alta.

Stores and apartments, cost $5,000, 4th ave. N.E., for E. P. Leacock. Builders, the Union Building Co., 127 Travers Block. Two storeys, 21 x 45, brick, cement foundation, felt and gravel roofing. Excavating done.

Warehouse, 11th ave. and 7th street west, for The Sherwin-Williams Paint Co., 88 Centre street, Montreal, Que. Architects, Hodgson & Butler, Grain Exchange Bldg. General contractors, Carter, Halls, Aldinger Co., 216 New Burns Block.

Edmonton, Alta.

Restaurant, cost $3,000, Queens, for A. E. May. General contractor, B. F. Cunningham. Two storeys, 60 x 100, concrete foundation, frame construction. Excavating done.

Hamilton, Ont.

Remodelling stores and apartments, cost $35,000, for A. Williamson and J. F. Torrance, Spectator Bldg. Architect, H. New, Spectator Bldg. Masonry, Wm. Inrig, 140 Flatt ave. Electrical work not let.

London, Ont.

Millinery warehouse, cost $7,000, for Dickison, Nicholson & Co., Ltd., 352 Richmond street. Architect, W. G. Murray, 111 Masonic Temple, London. General contractor, J. Moran, 557 Dundas street. Carpenter, J. Purdon, 429 King. Two storeys, 40 x 20, stone foundation, white brick construction.

Montreal, Que.

Garage, cost $5,000, for Sir Thomas Shaughnessy, 905 Dorchester. Builders, Bonnell Bros., 341 Guy street. One sty., 32 ft. 6 in. x 52 ft., cement foundation, cut stone and pressed brick construction.

Alterations to garage and flats, cost $8,000. Owner and builder, Robert Adair, 18 Mctavish. Raise one storey. Two storeys, 26 ft. 9 in. by 50 ft., concrete foundation, frame and brick construction, felt and gravel roofing.

Store and flats, cost $6,000, Decarie Blvd. Owner and builder, David Venne, 2220 St. Denis street. Three storeys, 23 x 60, concrete foundation, frame and brick construction, felt and gravel roofing.

Ottawa, Ont.

Cutting mill, cost $6,000, Montreal Rd. Owner and general contractor, The Bronson Co., Middle street. 56 x 48, cement and steel foundation, reinforced concrete construction, concrete floors, reinforced concrete roofing, mill machinery for cutting machinery, belting, etc., required.

Paradise, N.S.

Extension to apple warehouse, cost $4,000, for Paradise Trust Co. General contractors, J. H. Hicks & Sons, Bridgetown, N.S. 1½ storeys, 80 x 60, cement foundation, wood construction.

Prince Albert, Sask.

Store and office, cost $40,000. Owner and general contractor, T. E. Baker, 1915 First ave north. Four storeys, 50 x 120, brick, cement foundation. Foundations in.

Sault Ste. Marie, Ont.

Store and dwelling, cost $10,000, Queen street, for David Boldblatt. Architect, Thos. R. Wilkes. General contractors, Woolrich & Thornton. Two storeys, 25 x 80, stone foundation, terra cotta, brick and structural steel construction.

Toronto, Ont.

Garage, cost $4,000, Dundas. Owner and builder, C. J. Powley, 66 Parkway. 1½ storeys, 25 x 100, structural steel and brick construction, cement foundation.

Victoria, B. C.

Warehouse, cost $7,000, Yates and Douglas streets, for The Albion Stone Works, Pembroke street. Architect, J. C. M. Keith, 416 Sayward Bldg. General contractors, Knott & Sons, care architect. Two storeys.

Winnipeg, Man.

Publishing plant, Smith street, for the Tribune Publishing Co., 211 McDermot ave. Architect, J. D. Atchison, Trust & Loan Bldg., Portage ave. E. General contractors, Hazleton & Walin, 303 Donalda Bldg. Excavating started.

Residences

Annapolis Royal, N.S.

Residence, cost $3,000, for Dr. Chas. McLaughlin. 1½ storeys, frame construction. Plans in progress.

Residence, cost $3,000, for L. D. V. Chipman. Brick construction and foundation. Plans in progress.

Middleton, N.S.

Residence, cost $3,000, for G. C. Miller. Two storeys, wood construction, concrete foundation. Plans in progress.

Norwood, Ont.

Residence, cost $5,000, for W. Finlay. Architect, W. G. Murray, 111 Masonic Temple, London. Two storeys, stone & cement foundation, pressed brick construction. Plans in progress.

Ottawa, Ont.

Apartments, cost $18,000, for Leon Petigorsky, 191 Augusta. Three stys., solid brick construction, stone foundation. Plans in progress.

Three residences, cost $12,000, Regent, for Calib S. Green, 121 Cambridge. Stone foundation, brick veneer construction. Plans in progress.

Two residences, cost $10,000, Sunnyside, for T. H. Brewer, 313 Riverdale, general contractor. Architect, C. P. Meredith, 126 Sparks street. Sub-tenders will be let by owner, who has charge of plans. Cement foundation, brick veneer construction.

Apartments, cost $15,000, Rideau, for S. Armour, Royal Realty Co. Two stys. Plans will be prepared.

Residence, cost $8,000, Monkland, for R. Hooper, 91 4th ave. 2½ storeys, stone foundation, brick construction. Plans in progress.

Port Arthur, Ont.

Three residences, cost $9,900, for Geo. H. Otto. Architect, Glenn L. Saxton, 628 Plymouth Bldg., Minneapolis, Minn. Plans are with owner. 28 x 28, 28 x 26, concrete foundations, frame construction.

Residence, cost $6,000, for W. F. Trenks, 260 Court street north. Architect, W. T. Crouch, 217 Arthur street. Two storeys, 29 x 29, brick veneer, red clay construction, sandstone, cement foundation. Plans drawn.

Port Colborne, Ont.

J. J. Dickinson, West Main street, is contemplating the erection of an apartment house.

St. John, N.B.

Two detached residences, cost $18,000, Orange and Princess streets, for Kenneth Haley, Leinster street. Architect, Garnet Wilson, Princess street. Excavation, R. M. Tobias, 72 Brussels street. Three storeys, 60 x 50, Plans ready.

Toronto, Ont.

Apartments, cost $6,000, Gore street, for Marks & Cohen, 414 Spadina avenue. Tenders received by Building Supt., Wm. Griffiths, 74 Englewood ave., for roofing, painting, heating, plumbing and electrical work. Two storeys, 40 x 40. Mason, J. Redwood & Son, 9 Howard Park ave. Carpenter, owner. Architect and builder, owner.

Residence, cost $3,900, for W. Hughes, 547 Roxton Rd. Architect, W. J. Thompson, 567 Bloor west. 2½ storeys, 24 x 36, brick construction, stone foundation. Plans drawn.

Conservatory, cost $3,700, Spadina Rd. for A. W. Austin, 629 Confederation Life Bldg. Architects, John E. Webb & Co., 9 Fisher street. On estorey, 30 x 60, cement foundation, stone, structural steel and reinforced concrete construction Plans drawn.

Two pair residences, cost $12,000, for Cox & Cummings, 36 Canada Life Bldg. 2½ storeys, 17 x 38 each, stone foundation, brick construction. Plans drawn.

One pair residences, cost $6,000, for Wm. Horwood, 491 Concord ave. Architect, G. Miller, 1050 Dovercourt Rd. Tenders received by owner. 2½ stys., 36 x 42, stone foundation, brick construction.

Residence, cost $4,500, Pacific avenue, for H. O. Crane, 716 Spadina ave. Architect, W. Fraser, 34 Victoria street. 2½ storeys, 24 x 36, brick construction and foundation. Plans drawn.

Residence, cost $5,000, Indian Road, for Tweedie & Co., 469 Bathurst. Architect, Leonard Foulds, 2 Leader Lane. 2-storeys, 34 x 56, brick construction, brick foundation. Plans drawn.

One residence, cost $5,000, St. Clair, for W. W. Mason, 19 O'Hara ave. Architect, J. H. Galloway, 23 Toronto St. Two storeys, 30 x 48, brick construction and foundation. Plans drawn.

Residence, cost $5,500, 147 D'Arcy, for J. Kennedy, Arthur, Ont. Owner will purchase all material, most of the work will be done by day labor. Three stys., 44 x 36, stone foundation, Milton brick construction. Plans drawn.

Fifteen pair residences, cost $60,000, Marchmont, for W. H. Wright, 40 Rosedale Height Drive. 2½ storeys, 33 x 46, stone foundation, brick construction. Plans drawn.

One detached residence, cost $5,000, for Wm. Wood, 52 Oakwood ave. Architect, W. J. Thompson, 567 Bloor St. W. Two storeys, 24 x 32, stone foundation, brick construction. Plans drawn.

One detached residence, cost $3,000, for G. Harron, 117 Lawton ave. Architect, P. H. Finney, 79 Adelaide St. E. 2½ storeys, 26 x 42, stone foundation stone and brick construction. Plans drawn.

One pair residences, cost $5,000, Ravina Cres., for S. Dennis, 205 Elizabeth street. Architect, J. H. Stanford, Bloor and Ossington. Two storeys, 33 x 42, brick construction and foundation. Plans drawn.

Tilbury, Ont.

Two residences, cost $5,000, contemplated for Mrs. H. Phaneuff. Architect not yet chosen. 1½ storeys, brick foundation, brick construction.

Waterloo, Ont.

Residence, cost $6,000, for [illegible] contemplated by Lutheran Seminary Board, Rev. Bocklemann. Plans will be prepared.

Windsor, Ont.

Residence, cost $7,000, for [illegible] Hellinger, 69 Chatham street. Architect [illegible]

G. Jacques & Co., Boug Bldg. Two stys., pressed brick construction, stone and cement foundation. Plans in progress.

CONTRACTS AWARDED

Ancaster Twp., Ont.

Residence, Garage and stable, cost $5,000, for F. H. Whitton, care Steel Co. of Canada, Ltd., Hamilton. Architects, Mills & Hutton, Bank of Hamilton Bldg., Hamilton. General contractor, Thos. E. Wood, Dundas. Two storeys, 65 x 20 and 40 x 20, frame and stucco construction, cement foundation.

Edmonton, Alta.

Residence, cost $5,500, Wilson, for A. J. Henderson, Heminick street. General contractor, J. Mohr, 837 Ottawa street. Two storeys, 27 x 50, concrete foundation, frame construction. Excavating started.

Hamilton, Ont.

Apartments, cost $15,000, King St. E. Owner and general contractor, W. A. Noble, 80 George street. Contracts to be sub-let.

Residence, cost $3,600. Owner and general contractors, Sparks & McKay, 133 Cannon street east. Concrete foundation, brick construction.

Maidstone, Ont.

Residence, cost $4,000. Owner and builder, Vincent McCloskey, care Thos. Brown. Two storeys, white brick construction.

Montreal, Que.

Residence, cost $3,500, Royal avenue, for Edmond Gervais, 4502 St. Catherine W. Builder, Domina Cusson, 134 Prudhomme ave. Two storeys, 25 x 32, cement foundation, frame and brick construction.

Four flats, cost $3,000, Alywin. Owner and builder, Delpha Leduc, 257 Alywin. Three storeys, 16 x 45, cement foundation, frame and brick construction, felt and gravel roofing. Plans drawn.

Residence, cost $6,500. Owner and builder, J. B. Larose, 178 Berre. Four storeys, 25 x 50, concrete foundation, frame and brick construction, felt and gravel roofing.

Three flats, cost $3,000, St. Germain. Owner and builder, Alicide Thibault, St. Germain. Three storeys, 25 x 34, concrete foundation, frame and brick construction, felt and gravel roofing.

Residence, cost $5,000, Oxford, for Miss F. Farnier, 87 Christophe Colomb. Builders, Robertson & MacNaughton, care owner. Two storeys, 25 x 38, concrete foundation, cut stone and pressed brick construction, felt and gravel roofing.

Residence, cost $4,[illegible], Marquette. Owner and general contractor, [illegible] Three storeys, [illegible], stone foundation, frame and pressed brick construction.

Five flats, cost $5,000, Alywin. Owner and builder, Charles Ouellette, [illegible] Alywin. Three storeys, 25 x 45, concrete foundation, frame and brick construction, felt and gravel roofing.

Ottawa, Ont.

Residence, cost $4,500, Adelaide street. Owner and general contractor, George Ward, 29 Adelaide street. Brick veneer construction, stone foundation. Excavating done.

Residence, cost $4,200. Owner and general contractor, W. O. Millar, 34 Bayswater. 24 x 34, brick veneer construction, stone foundation.

Residence, cost $3,800. Owner and general contractor, Robert Edmondson, 62 Blackburn. Stone foundation, brick veneer construction. Excavating done.

Quebec, Que.

Residence, cost $3,000, for Jos. Samson, 345 St. Paul street. Three storeys, 40 x 50, stone foundation, brick construction. Built by day under supervision of owner. Foundations started.

Residence, cost $3,000. General contractor and architect, E. Tremblay, Lemontagne St., Limoilou. Work done by day labor under owner's supervision. 3-storeys, 30 x 42, brick and wood construction, stone foundation. Excavating done.

Residence, cost $5,000. General contractor and architect, Wm. Bousquet, cor. St. Claire and St. Oliver. Work done by day labor. Three storeys, 50 x 65, brick and wood construction, stone foundation. Excavating done.

South Edmonton, Alta.

Residence, cost $4,500, Main street. Architect and general contractor, R. E. Miller, 582 5th ave. N.E., South Edmonton. Two storeys, 22 x 28, concrete foundation, frame and brick veneer construction. Excavating done.

Toronto, Ont.

Two pair residences, cost $16,000, Ossington ave. Architect and builder, Geo. H. Paul, 16 Stonehouse Cres. Brick construction and foundation. Plans drawn.

Two detached residences, cost $6,000, Thorburn. Owner and builder, J. Grand, 138 Clinton street. 2½ storeys, 24 x 38, brick construction, stone foundation.

Two residences, cost $7,000, Rowland. Architect and builder, Herman C. Card, 263 Evelyn ave. 2½ storeys, brick construction and foundation. Excavation

Apartments, cost $8,000, Summerhill Owner and builder, Wm. Moss (in trust) 50 Hewitt ave. Two storeys, brick construction and foundation.

Apartments, Grenadier Road, for Wm. Vokes, 228 Rusholme Rd. Architect, J. G. Hedges, 210 Clinton street. Stone, Patterson & Dick. Carpentry, John Ballantyne, 723 Brock ave. Excavating, Joe Bennett, 143 Caledonia ave. Two storeys, 28 x 55, stone foundation, brick construction, shingle, felt and gravel roofing.

Two detached residences, cost $6,200 Owner and builder, J. H. Lowery, 28 Hain ave. Two storeys, 22 x 33, brick construction, stone foundation

Five detached residences, cost $14,500, Woodycrest. Owner and builder, D [illegible] 20 x 42 each, brick construction and foundation.

Residence, cost [illegible] Owner and builder, H. F. Sanders, 35 Geoffrey street. Two storeys, 22 x 36, brick construction and foundation.

Residence, cost [illegible] for H. A. Bruce, 61 Bloor E. Architect [illegible] tractors, Holtby Bros., Hepbourne St. Three storeys, 34 x 41, brick foundation structural steel and [illegible]

Four detached residences, cost [illegible]

(Continued on page [illegible])

Tenders and For Sale Department

CITY OF REGINA

SEWERS

[illegible] to the City Commis[illegible] will be received up until 12 o'clock noon, **May 15th, 1913**, for the following [illegible]

[illegible] of approximately:

[illegible] lineal feet of 6-in. sewer pipe.
[illegible] lineal feet of 8-in. sewer pipe.
[illegible] lineal feet of 9-in. sewer pipe.
[illegible] lineal feet of 10-in. sewer pipe.
[illegible] lineal feet of 12-in. sewer pipe.
2,500 lineal feet of 15-in. sewer pipe.
7,000 lineal feet of 18-in. sewer pipe.
2,500 lineal feet of 24-in. sewer pipe.

[illegible] of approximately:

1,755 lineal feet of 30-in. concrete pipe.
1,025 lineal feet of 36-in. concrete pipe.
1,300 lineal feet of 42-in. concrete pipe.

(C) Supply and delivery of approximately:—
450,000 sewer brick.

(D) Supply and delivery of approximately:—
2,000 bbls. of cement.

(E) Supply and delivery of approximately:—
200 manhole covers.

(F) Supply and delivery of approximately:—
1,000 cubic yards of sand.

(G) Labor for laying sewers.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender. The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

[illegible] F. McARTHUR, City Engineer.

Tenders for Dredging

Sealed tenders addressed to the undersigned, and endorsed "Tender for Dredging, Deseronto, Ont.," will be received until 4 p.m., on **Tuesday, April 22, 1913**, for dredging required at Deseronto, Ontario.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Pub[illegible] for fifteen hundred dollars ($1,500), [illegible] be forfeited if the person tendering [illegible] to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
[illegible] April 14, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the [illegible] 16

Separate sealed tenders addressed to the undersigned will be received until 4 p.m., on **Monday, April 28, 1913**, for the supply of hardware, brushes, manilla rope, packing, paint and paint oil, hose, wire rope, oils and greases, steam pipe and steam fittings, and chain for the departmental dredging plant in Ontario and Quebec.

Each tender must be sent in a separate envelope and endorsed "Tender for Hardware, Ontario and Quebec," "Tender for brushes, Ontario and Quebec," etc., as the case may be.

Tenders will not be considered unless made upon forms furnished by Department, and in accordance with conditions contained therein.

Combined specification and form of tender can be obtained at this Department and at the offices of J. L. Michaud, Esq., District Engineer, Merchants Bank Building, Montreal, P.Q., and J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, for the amount mentioned in the tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
—37612. Ottawa, April 5, 1913.

15-16

Sealed tenders addressed to the undersigned, and endorsed "Tender for Kingston Harbor Improvements," will be received at this office until 4 p.m. on **Wednesday, April 30, 1913**, for the construction of a combined Roadway and Wharf across the Cataraqui River, and Dredging in Kingston Harbor, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Bldg., Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Merchants Bank Building, St. James street, Montreal; A. R. Decary, Esq., District Engineer, Post Office Building, Quebec, and on application to the Postmaster at Kingston, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—35224. 15-16

TOWN OF SUDBURY

PROVINCE OF ONTARIO

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on **Thursday, May 1st, 1913**, for the completion of Main Sewer, 20-inch, 18-inch, 15-inch and 12-inch, with accessories. The Corporation will furnish the pipes.

Plans, specifications, etc., may be seen at the office of the Engineers, Toronto, or at Sudbury, on and after April 16th.

No tenders necessarily accepted.

J. G. HENRY, Esq., Mayor.
GEO. ELLIOTT, Esq., Town Clerk.
GEO. TUDDENHAM, Esq.,
Chairman Sewerage Committee.
CHIPMAN & POWER, Engineers,
16 204 Mail Building, Toronto.

Department of Railways and Canals, Canada

TRENT CANAL

Notice to Contractors

FENELON FALLS DAM

Sealed tenders, addressed to the undersigned and marked "Tender for the Fenelon Falls Dam, Trent Canal," will be received at this office until 16 o'clock on **Thursday, May 1st, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after April 3rd, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind, that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $1,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 4th April, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—39430. 15-16

Extension of Time

TENDERS

To Contractors

Bulk or separate tenders will be received by the undersigned up to

WEDNESDAY, APRIL 23rd

at 5 o'clock p.m., for the several trades required in the erection of a

Warehouse Building

on the southeast corner of Adelaide and Charlotte streets, Toronto.

Plans and specifications may be seen and all other information obtained at the offices of the architect.

The lowest or any tender not necessarily accepted.

GEO. W. GOUINLOCK, Architect,
Suite 1108 Temple Building,
16 Toronto, Ont.

Steel or Reinforced Concrete Water Tower

Sealed tenders addressed to George K. Crocker, Esq., Chairman Board of Water Commissioners, St. Thomas, Ont., will be received up to noon of **Wednesday, April 30th, 1913**, for the following:—

(a) Steel Water Tower—capacity 500,000 Imperial gallons.

(b) Reinforced concrete water tower, capacity 500,000 Imperial gallons.

For specifications or any further information apply to James A. Bell, Engineer, County Buildings, St. Thomas, Ont. ... ...

S. O. PERRY, Secretary-Treas.,
16 St. Thomas, Ont.

City of Moose Jaw, Sask.

TENDERS FOR

Manhole Frames and Covers.

Sealed tenders marked "Tenders for Manhole Frames and Covers," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following material, F.O.B. cars Moose Jaw. Local tenderers must bid on the material delivered at the City Store Yards.

100 valve chamber frames and covers.
100 manhole frames and covers.

Detailed plans and specifications may be obtained on application to J. Antonisen, City Engineer, Moose Jaw.

Time of delivery must be stated.

Each tender must be accompanied by a marked cheque, payable to the City Commissioners, for five per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.

Dated at Moose Jaw,
This 1st day of April, 1913. 15 17

WESTON, ONTARIO

Sewage Disposal Works

Sealed tenders for the construction of Sedimentation Tanks, Dosing Chamber, Percolating Filters, Humus Tank, etc., are required.

Specifications and Forms of Tender may be obtained and plans seen at the office of the undersigned engineer. Tenders to be sent in not later than noon of the 5th day of May, 1913, to the Clerk.

J. H. TAYLOR, Clerk.
J. BULL, Reeve.
T. AIRD MURRAY, Consulting Engineer,
16 303 Lumsden Bldg., Toronto.

Thorold Public School

Bulk or separate tenders will be received by the undersigned for all trades required in the erection and completion of a new Public School Building to be erected in the Town of Thorold, Ont., until 5 p.m., **Monday, April 21st, 1913**,

Plans and specifications may be seen at the office of the Architect, 46 Queen Street, St. Catharines, Ont., Public Library Building, Thorold, Ont., and at the office of the Contract Record and Engineering Review, Toronto, Ont.

The lowest or any tender not necessarily accepted.

A. E. NICHOLSON, Architect,
46 Queen Street,
15 16 St. Catharines, Ont.

Tenders Wanted

Public School Board Edmonton

Sealed tenders will be received by the undersigned up to **Thursday, May 1st, 1913**, for the erection of a seventeen class room brick school in Westmount Subdivision, Edmonton, Alta.

Tenders must be accompanied by a certified cheque for five per cent. of tender.

Plans and specifications may be obtained at the Public School Board, Edmonton.

The lowest or any tender not necessarily [illegible]

Edmonton Public School Board,
16 [illegible]

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection [illegible]

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works [illegible]

[illegible]

Contract Record and Engineering Review

[illegible]

TOWN OF AYLMER, ONT.

Tenders for Street Paving

Sealed tenders, addressed to the undersigned, will be received up to 6 p.m., **April 30th, 1913**, for approximately the following:

22928 sq yds. of reinforced concrete pavement.
7334 sq. yds. of macadam pavement.
2497 sq. yds. of brick pavement with concrete base.

Plans and specifications may be seen at the office of the Town Clerk, Aylmer.

The lowest or any tender not necessarily accepted.

D. C. DAVIS, Clerk.
[illegible] 12th, 1913. [illegible]

CITY OF REGINA

Pavements and Sidewalks

Sealed tenders addressed to the City Commissioners, Regina, will be received up until 12 o'clock noon, **May 15th, 1913**, for the following works:—

(A) Approximately 150,000 sq. yds. of street pavement.

(B) Approximately 32,000 sq. yds. of track pavement.

(C) Approximately 80,800 lineal feet of crub and gutter.

(D) Approximately 2,300 lin. ft. of straight curb.

(E) Approximately 558,000 sq. ft. of concrete sidewalk.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender.

The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

16 19 [illegible]

City of Moose Jaw, Sask.

TENDERS FOR

Valves and Hydrants

Sealed tenders, marked "Tenders for Valves and Hydrants," addressed to the City Commis [illegible] o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following, [illegible]

65 6-in. Hydrants with turn buckle spindle. Two $2\frac{1}{2}$-in. hose connections and one 3 in. steamer connection. All connections to have seven [illegible] provided and have a depth of 8 ft. 2 in. The top of the main valve stem shall fit [illegible]

86 6 in. gate valves and spindles
50 8 in. gate valves and spindles
10 10 in. gate valves and spindles
35 12 in. gate valves and spindles

[illegible] propose to supply. No tender will be considered [illegible]

[illegible] cheque in favor of the Corporation of Moose Jaw for five per cent. of the total amount of the [illegible]

[illegible]

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, [illegible]

Dated at Moose Jaw,
[illegible]

TOWN OF SIMCOE
Province of Ontario

Sewerage Works

Notice to Contractors

[illegible] will be received by the Town Clerk until 8 p.m. on **Wednesday, April 23, 1913,** for the following works:—

[illegible] Main Sewer and Sewage [illegible]
[illegible] Pipes
Contract G. Sewage Pumping Machinery .
[illegible]
[illegible]
Contract X. Sewage Disposal Works.

Plans and specifications may be seen at the [illegible] at the Town Hall, Simcoe, Ont.

No tenders necessarily accepted.

L. C. GIBSON, Esq., Mayor,
W. C. McCALL, Town Clerk,
15-16 CHIPMAN & POWER, Engineers

Tenders Wanted

Bridge Painting

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Bridge Painting," will be received by the Council of the Township of Etobicoke until ten o'clock a.m., **Monday, May 5th, 1913**, for cleaning the steel work of six steel bridges within the Township. For specifications and further information apply to the undersigned.

J. A. L. MACPHERSON, Engineer,
Islington, Ont.
April 9th, 1913. 15-16

Sealed tenders addressed to the undersigned and endorsed "Tender for Coal for Departmental Dredges, Ontario and Quebec," will be received at this office until 4 p.m., on **Monday, April 21, 1913**, for the supply of Best Quality Steam, Anthracite and Blacksmith coal, to be delivered in quantities and at places mentioned on forms of tender.

Combined specification and form of tender can be obtained at this Department and at the offices of J. L. Michaud, Esq., District Engineer, Merchants Bank Bldg., Montreal, P.Q., and J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, for amount specified on tender form, which will be forfeited if the persons tendering decline to enter into a contract when called upon to do so, or fail to complete the contract. If the tender be not accepted, the cheque will be [illegible]

The Department does not bind itself to accept the lowest or any tender.

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, April 3, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—37722. 15-16

TOWN OF SARNIA
PROVINCE OF ONTARIO

Tender for Waterworks

Sealed tenders, registered, and clearly marked on the outside of the envelope: "Tender A," etc., as the case may be, and addressed to the Town Clerk, Sarnia, Ontario, will be received up to 9 p.m., **Monday, April 28th, 1913**, for the supply of material and the construction of:

Contract "A"—Labor laying approximately 11,700 feet of 24-inch force main.
Contract "B"—Furnishing all material for and constructing pumping station.
Contract "C"—Furnishing all material for and constructing infiltration basin and sluiceway.

Copies of plans and profiles, specifications and instructions to bidders, may be seen at the office of H. A. McLean, Town Engineer, Sarnia, or at the office of Chipman & Power, Engineers, Toronto.

No tender necessarily accepted.

DR. J. A. BELL, Mayor,
DR. W. A. HENDERSON,
Chairman Fire and Water Committee.
16-17 J. D. STEWART, Town Clerk.

City of Moose Jaw, Sask.

TENDERS
FOR
Tile Pipe and Specials

Sealed tenders, marked "Tenders for Cast Iron Pipe and Specials," addressed to the City Commissioners, Moose Jaw, will be received up till twelve o'clock noon on **Wednesday, April 30th, 1913,** for the supply and delivery of the following material, F.O.B. cars, Moose Jaw:—

120	ft.	20-in. pipe
6000	ft.	12-in. pipe
1100	ft.	10-in. pipe
8620	ft.	8-in. pipe
23000	ft.	6-in. pipe
3000	ft.	4-in. pipe
40		6-in. off 6-in. Tees
32		6-in. off 8-in. Tees
7		6-in. off 10-in. Tees
10		6-in. off 12-in. Tees
2		12-in. off 12-in. Tees
6		8-in. off 12-in. Tees
6		6-in. x 6 x 6 x 6 crosses
6		6 x 6 x 8 x 8 crosses
2		6-in. x 6-in. x 10-in. x 10-in. crosses
5		6-in. x 6-in. x 12-in. x 12-in. crosses
2		10-in. x 10-in. x 12-in. x 12-in. crosses
1		10-in. to 12-in. increaser
150		6-in. offsetts
60		8-in. offsetts
10		10-in. offsetts
60		12-in. offsetts
50		6-in. plugs
25		6-in. caps
25		8-in. plugs
15		8-in. caps
10		10-in. plugs
10		10-in. caps
10		12-in. plugs
10		12-in. caps
6		6-in. 1/4 bends
6		6-in. 1/8 bends
6		8-in. 1/4 bends
6		8-in. 1/8 bends
5		10-in. 1/4 bends
5		10-in. 1/8 bends
5		12-in. 1/4 bends
5		12-in. 1/8 bends

All pipes to be class "C" and all specials to be class "D." All pipes and specials must conform to the standard specifications of the Canadian Society of Civil Engineers. Tenderers must state time of delivery, and each tender must be accompanied by a marked cheque in favor of the Corporation of the City of Moose Jaw for 5 per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
1515 Rockefeller Bldg., Cleveland, O.

TOWN OF WATROUS
Province of Saskatchewan

Appointment of Town Engineer

Applications are invited for the position of Town Engineer to supervise the construction of Waterworks Distributing System, Sewerage Disposal System and Concrete Sidewalks.

Applicants should state experience and salary required.

Applications should be addressed to the undersigned to be received not later than April 21st, 1913.

F. C. WRIGHT,
15-16 Secretary-Treasurer.

City of Moose Jaw, Sask.

TENDERS
FOR
Cast Iron Pipe and Specials

Sealed tenders, marked "Tenders for Tile Pipe and Specials," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon, on **Wednesday, April 30th, 1913**, for the supply and delivery of the following, f.o.b. cars, Moose Jaw:—

1500	ft.	20-in. pipe.
2000	ft.	18-in. pipe.
2800	ft.	15-in. pipe.
900	ft.	12-in. pipe.
8000	ft.	10-in. pipe.
23000	ft.	8-in. pipe.
40000	ft.	6-in. pipe.
1200	ft.	4-in. pipe.
26		6-in. off 20-in. Tees
90		6-in. off 18-in. Tees
50		6-in. off 15-in. Tees
15		6 in. off 15-in. Y's
20		6-in. off 12-in. Tees
10		6-in. off 12-in. Y's
350		6-in. off 10-in. Tees
200		6-in. off 10-in. Y's
500		6-in. off 8-in. Tees
400		6-in. off 8-in. Y's
6		4-in. off 18-in. Tees
5		4-in. off 15-in. Tees
15		4-in. off 10-in. Tees
45		4-in. off 8-in. Tees
125		4-in. Elbows
12		pieces 20-in. channel pipe
6		pieces 18-in. channel pipe
20		pieces 15-in. channel pipe
8		pieces 12-in. channel pipe
40		pieces 10-in. channel pipe
85		pieces 8-in. channel pipe
850		4-in. to 6-in. increasers.
800		6-in. 1/8 Bends.

All pipes and specials must be first class glazed tile. All pipe and specials over 12-in. to be of double strength. Tenderers must state time of delivery. Each tender must be accompanied by a marked cheque in favor of the Corporation of Moose Jaw for five per cent. of the total amount of the tender. The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

TENDERS

Sealed tenders addressed to the Secretary, Department of Indian Affairs, Ottawa, will be received up to noon, **Saturday, May 3, 1913**, for the construction of a steel highway bridge over Conger Creek in the Maniwaki Indian Reserve, County of Wright, Quebec.

Detailed information will be furnished on application to the said Secretary of the Department of Indian Affairs.

The lowest or any tender will not necessarily be accepted.

The unauthorized insertion of this advertisement in any newspaper will not be paid for.

J. D. McLEAN,
Asst. Deputy and Secretary.

Department of Indian Affairs.
-38623. Ottawa, March 18, 1913 14-16

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Bracebridge, Ont.," will be received at this office until 4 p.m. on **Monday, April 28, 1913**, for the work mentioned.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station F. Yonge street, Toronto, at the Post Office, Bracebridge, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—36823. 15-16

FOR SALE

Koehring Concrete [illegible] Mixer, [illegible] 14 cu. ft.; used three months, in perfect condition.

20 H.P. Case Traction Engine with contractors fuel bunkers, in perfect condition; used two months.

Three rock drills, good condition. Apply Box 761, Contract Record, Toronto, Ont. 14-16

FOR SALE

Dredge and Derrick [illegible] and 20 horse power [illegible] Engine, [illegible] Case Roller, "steam steerer," 19 Dump Waggons, Wheel and Drag Scrapers, [illegible] Picks. All in good working order [illegible]. Apply to H. A. Camjaigne, Niagara House, Niagara Falls, Ont. 10-T.F.

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

Yellow Pine Timber

We have on hand in London and Sarnia, a quantity of Yellow Pine Timbers, 8 x 14 to 12 x 12, 12 to 24 ft. long. Prompt shipment can be made. For further particulars apply to The London Lumber Co., Ltd., London, Ont. 16

DO YOU NEED HELP?

If so let us know. We can furnish any amount of skilled and unskilled labor at shortest notice.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.

[illegible] Adelaide 3919 14-17

Situations Wanted

Superintendent seeks an appointment; had life's experience on Railway, Dock and Harbor Work. Highest references. Box 764, Contract Record, Toronto, Ont. 15-17

Situations Vacant

[illegible] handling reinforced concrete, carpenter by trade preferred.

Apply H. D. EVANS, Sudbury, Ont.
16-17

WANTED—Steam shovel operator. Must be sober and an expert. Long job for right man. Write, giving all particulars, stating previous experience, salary expected, etc., to Box 766, Contract Record, Toronto, Ont. 16

Wanted

Experienced estimator for large plumbing and heating contracting firm located in Toronto. Permanent position. State salary and experience. Box 768, Contract Record and Engineering Review, Toronto, Ont. 16-17

Draughtsman Wanted

Architectural draughtsman with experience in city offices. Apply by letter to

F. S. BAKER, Architect,
16 Traders Bank Bldg., Toronto, Ont.

Wanted

[illegible] and power line, also with town and city authorities for which poles are largely used for orna[illegible] needed in this special line. Write stating pre[illegible] 16-17

Residences

(Continued from page 76)

[illegible]

Windsor, Ont.

[illegible] excavating and masonry, [illegible] Walkerville. Carpentry, Lambert & Braithwaite, 6 Riviere ave., Sandwich. Painting and glazing, R. W. Halloway. Heating and plumbing, Windsor Hardware Co., Sandwich and Windsor. Electrical work, A. Cook. Interior fittings, Detroit Roof & Tile Co., Detroit, Mich. Sheet metal, Windsor Hardware Co. 1[illegible] storeys, 41 x 28 ft. 6 in., brick foundation, cobble stone construction.

Residence, cost $3,200. Owner and builder, Archibald Preney, Sutherland, Ont. 1½ storeys, white brick construction, stone and cement foundation.

Winnipeg, Man.

Seven residences, cost $21,000, Banning street. Architects and general contractors, Home Builders Ltd., 41 Somerset Bldg. Two storeys and basement, 22 x 28 each, frame construction.

Two residences, cost $10,000. Architect and general contractor, W. E. Toshack, 78 Cathedral ave. Permit issued.

Power Plants, Electricity and Telephones

Hamilton, Ont.

Power sub-station contemplated for Hamilton Hydro-electric Department, City Hall. Engineer in charge, E. J. Sifton. The Board is considering proposal to build station and combination club room for west end park.

St. Marys, Ont.

The Hydro-electric Power Commission, Queen street east, Supt. Miller, contemplate the purchase of transformer, etc.

Stratford, Ont.

Lighting and general equipment is to be purchased for the new extension to Sebringville. Superintendent, R. H. Myers, Electrical Department.

Toronto, Ont.

Consumers Gas Co. intend making large additions to present service.

Miscellaneous

Calgary, Alta.

Supply of 85,000 barrels of cement. General contractors, The Canada Cement Company, Temple Building, Toronto. Clerk, J. M. Miller.

Galt, Ont.

Tenders will be received by Clerk, Jos. McCartney, up to April 16th, for 1,000 barrels, more or less, Portland cement

Prince Albert, Sask

Fire apparatus, cost $30,000, contemplated by City Council. Clerk, C. O. Davidson. Fire Chief, Ald G. Wagner. By-law passed.

Port Arthur, Ont.

Cedar poles required by city. Tenders received by Commissioner of Utilities, J. [illegible] poles, 7-in. top; 100 40-ft poles, 7 in top; 100 45-ft. poles, 7-in. top. Certified [illegible] der to accompany it

Quebec, Que.

[illegible] city council. See fire commission [illegible]

[illegible] awarded to Seagrave & Company, Walkerville, at $7,200 each.

Sherbrooke, Que.
City [illegible] purchasing auto chemical fire engine. Clerk, [illegible] J. Griffith, City Hall.

Business Notes

Boston Mills, Ont.
[illegible] mill owned by J. H. McCauley burned. Gas producer engine and machinery also destroyed.

Edson, Alta.
Business blocks burned. Owners, Mr. Herbert, of Winnipeg; Mr. Rivers, of Edson; J. H. Lloyd, of Vancouver. Buildings were occupied by firms in several lines of business. Loss to buildings, [illegible]; stock, $125,000.

Iona, Ont.
Railway station and freight house, owned by Michigan Central Railway, burned. Div. Supt., Henry Shearer, St. Thomas. Buildings a complete loss.

La Salette, Ont.
R. C. Church burned. Priest, Rev. Father Brennan. Building is a total loss.

Montreal, Que.
Factory of Paterson Mfg. Co., mfrs. roofing paper, 2021 St. Hubert street, burned. Supt., Mr. Harry F. Childs. Building to be repaired at once.

Warehouse owned by La Rue & Cloutier, wholesale grocer and liquor merchants, 246 St. Paul street, burned, damage to above 5-storey building estimated at $100,000, covered by insurance. To be rebuilt at once.

Residence owned by Mrs. N. Stirrup, 224½ Sanguinet street, burned, loss $4,500. Will be rebuilt.

Club house of Montreal Hunt Club, St. Catherine road, Cote des Neiges, burned, loss $10,000. Secretary, J. R. Junes, Imperial Bank Building. Will rebuild at once.

Store, 256 St. James street, owned by Rod Sangster, 2435 Mance street; loss $150,000. Will rebuild.

Saloon. Owned by Thomas Westlake, 125 Congregation street, burned. Damages, $15,000. Will rebuild.

Machinery plant, owned by Miller Bros. & Toms, 120 Dalhousie, burned. Loss, [illegible], covered by insurance.

Megantic, Que.
Factory of Megantic Furniture Company burned. Loss estimated at $50,000. Will rebuild.

Rodney, Ont.
Plants of the Canada Casket Co., Queen street, and Lusty Lumber Co., Queen street, burned. Loss $20,000; insurance $9,000.

Ridgetown, Ont.
Telephone Exchange of Bell Telephone Co., head office Montreal, Que., burned. Local representative, C. W. Halstead. Post office also destroyed.

Sarnia, Ont.
Factory of John Goodison Thresher Co., 236 Mitton street, burned. Loss estimated at $50,000, covered by insurance.

Toronto, Ont.
"Wellsboro" Apartment House, 414 Jarvis street, burned. Owned by Deeth & Sons, Ltd., 44 Grove ave. Loss estimated at $5,000.

West Lorne, Ont.
Hotel owned by Mrs. Joseph Wilton, burned, loss $10,000. Insurance $3,000.

New Companies

Stacey Builders Limited have been incorporated with a capital of $40,000, to carry on business as carpenters, contractors and builders, etc., with head office at Oshawa. The provisional directors are John Stacey, contractor, C. N. Stacey, builder, and F. L. Mason, superintendent, all of Oshawa.

The King Land Company, Limited, has been incorporated with a capital of $40,000, to erect buildings and deal in building material, with head office at Toronto. The provisional directors are R. E. King, real estate broker, J. J. King, accountant, and J. T. Loftus, barrister, all of Toronto.

Garden Farms of Ontario, Ltd., incorporated with a capital of $40,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are J. E. Thompson, broker, H. T. Canniff, barrister, and W. J. Thompson, real estate agent, all of Toronto.

The Canadian Pulp & Lumber Company, Limited, has been incorporated, with a capital of $25,000, to carry on business as manufacturers and dealers in wood, pulp and paper of all kinds, to also construct and operate pulp and paper mills, to manufacture timber, logs and lumber, etc., with head office at Latchford. The provisional directors are J. S. Lovell, accountant, Wm. Bain, bookkeeper, and Robt. Gowans, solicitorc' clerks, all of Toronto.

The Ojibway Realty Company, Ltd., has been incorporated with a capital of $40,000, to carry on a general land and building business with head office at Sandwich. The provisional directors are to carry on business as general contractors and engineers, with head office at Peterboro. The provisional directors are L. P. Sherwood, Harold Fisher, barristers, and S. M. Clark, law student, all of Ottawa.

Industrial Planing Mills, Limited, incorporated with a capital of $40,000, to manufacture and deal in lumber, wood and builders' supplies, with head office at Toronto. The provisional directors are Dan Sweetman, John Monkhouse, manufacturers, and Emerson Tiers, builder, all of Toronto.

The John Hayman and Sons Company, Limited, has been incorporated with a capital of $100,000, to carry on business as a general building, contracting and construction business, with head office at London. The provisional directors are John Hayman, Chas. F. Hayman, and W. H. Hayman, contractors, all of London.

The Fireproof Construction Company, Limited, has been incorporated with a capital of $50,000, to carry on business as general contractors, with head office at Toronto. The provisional directors are Arthur Tucker, insurance underwriter, R. H. Hill, accountant, and Owen P. Jones, adjuster, all of Toronto.

Queen City Investments, Limited, have been incorporated with a capital of $40,000 to deal in builders' and contractors' supplies with head office at Toronto. The provisional directors are Edmund Eisinger, law clerk, Geoffrey Adams and F. H. Snyder, law students, all of Toronto.

A. E. Ponsford, Limited, incorporated with a capital of $60,000 to carry on business as a building and contracting company with head office at St. Thomas. The provisional directors are J. C. Ponsford, A. E. Ponsford, contractors, and E. P. Cach, accountant, all of St. Thomas.

NOTICE TO OUR CUSTOMERS

¶ Please take note that from 1st of May next our mills and Head office will be located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

Lyster Wood Box Turning Enamelling Company, Limited
LYSTER
Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.

HOISTS AT SPECIAL PRICES

We offer the following "LIDGERWOOD" hoists at considerable reduction in prices.
They are new machines of standard design and are available for immediate shipment.
They represent surplus stock which we do not wish to carry over the present season.

Contractors' Hoists

Size No.	Description	Weight
8	6¼ x 8 Double Cyl., Single Drum, 36 x 75 Boiler,	6,250 lbs.
9	7″ x 10″ " " " " 40″ x 84″ "	8,250 "
70¼	6¼″ x 8″ " " Double Drum, 36″ x 75″ "	8,400 "
71	7″ x 10″ " " " " 40″ x 84″ "	10,200 "
71½	7″ x 10″ " " " " (without Boiler)	5,700 "

High Speed Hoists

54	7″ x 10″ Reversible Link Motion - - -	5,200 "
55	8¼″ x 10″ " " " - - -	6,400 "
60	6¼ x 8 Single Friction Drum, non-reversible -	3,600 "

PRICES AND CATALOGUE ON APPLICATION

ALLIS-CHALMERS-BULLOCK, LTD.

Sales Offices—Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.

Jennings & Ross, Limited

Engineers and Contractors
TORONTO

Royal Bank Building, King and Spadina

Phone Ade. 282

Showing progress of
building 250 ft. x 300 ft. for

Rolph & Clark, Limited

RAILWAY CONSTRUCTION PLANT

Hoisting Engines, Horse Powers, Hand Winches, Derricks, Car Wheels, Axles and Boxes, Dump Cars, Rail Cars, Buckets

MARSH & HENTHORN, Limited

Makers of Hoisting Machinery **BELLEVILLE, ONT.**

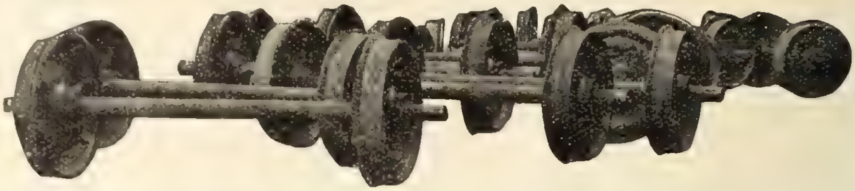
Send for Catalog

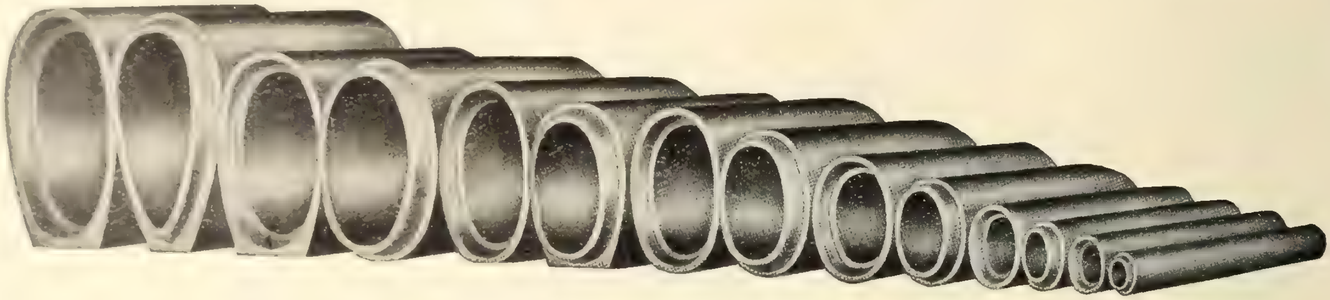
SALES AGENTS

MUSSENS

LIMITED

Montreal, Que.





Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

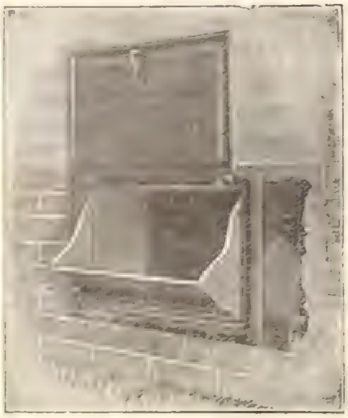
STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario



EQUIP YOUR CELLAR

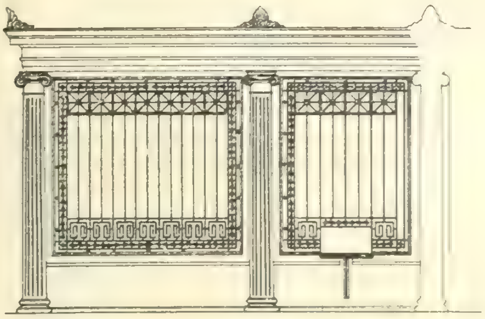
with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited

Galt, Ontario, Can.

Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta



Send for
Section A
of our
new loose
leaf
Catalogue

Metal Work for Banks and Offices

Counter Grills Wickets
Tellers Cages, Brass Floor Railings
Door and Window Grills

We have a large, modern plating plant, enabling us to furnish all the latest electro-plated finishes.

Dennis Wire & Iron Works Co.
Limited
London, Ont.
Toronto Branch : 36 LOMBARD STREET

Have You Investigated Our
STEEL ROOFING
FOR
FLAT ROOFS?

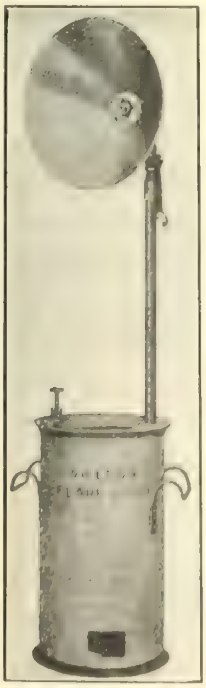
It is an easily laid roofing and makes a durable, fireproof and weatherproof job.

We want every Contractor and Builder to have a sample of this "Flat" Roofing, also our Illustrated Catalogue. Sent free on request.

Corrugated Iron Metallic Shingles
Metallic Sidings Metallic Ceilings
Etc., Etc.

The Metallic Roofing Co.
LIMITED
Manufacturers
TORONTO, ONT. WINNIPEG, MAN.

Contractors' Acetylene Flare Lights



Made in Two Sizes

SIZE NO 1—
8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.
Price F.O.B. Ottawa $95.00.

SIZE NO. 2—
1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.
Price F.O.B. Ottawa $65.00.

Manufactured by
International Marine Signal Co.
Limited
Ottawa, Canada

FOR SALE

1—20 H.P. Portable Boiler and Engine on wheels.
1—12 H.P. Portable Boiler on wheels.
1—30 H.P. Loco. Firebox boiler on skids.
1—35 H.P. Loco. Firebox boiler on skids.
1—10" x 16" Champion Stone Crusher.
2—2½" Steam Drill.
2—½ yd. Smith Mixer.
1—No. 5 Pulsometer Pump.
1—9" x 6" Sand Pump.
20—3 yd. Dump Cars.
3—2 H.P. Electric Motors, A. C.

The above machines are slightly used and for all practical purposes as good as new.

Fleming Machinery Company
340 Sparks Street, Ottawa, Ont.

Gravity System Equipment on Large Concrete Building

Gravity System Distributing Concrete

A system that improves the concrete and reduces the cost.

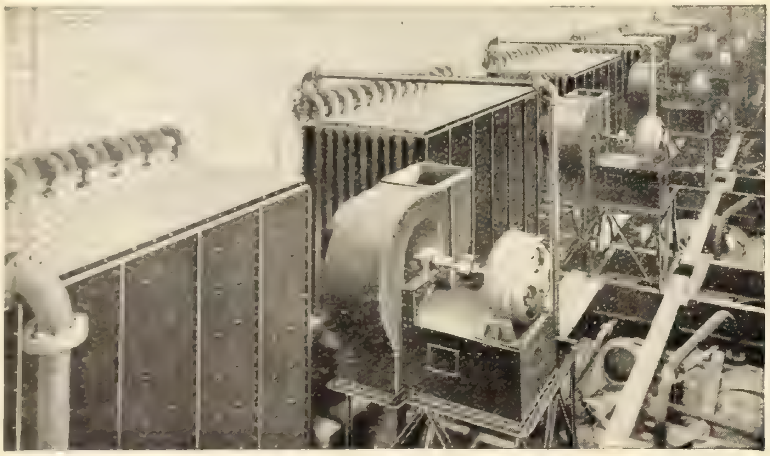
Information gladly furnished and estimates given on any work.

Canadian Concrete Appliance Co., Ltd.

Sole Licencees for Canada

613 Vancouver Block,
VANCOUVER
B. C.

Eastern Representatives
Stinson Reeb Builders' Supply Co., Ltd.
Montreal, P. Q.



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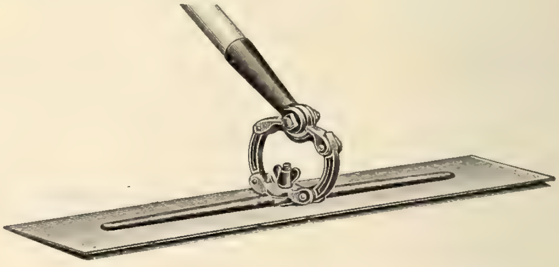

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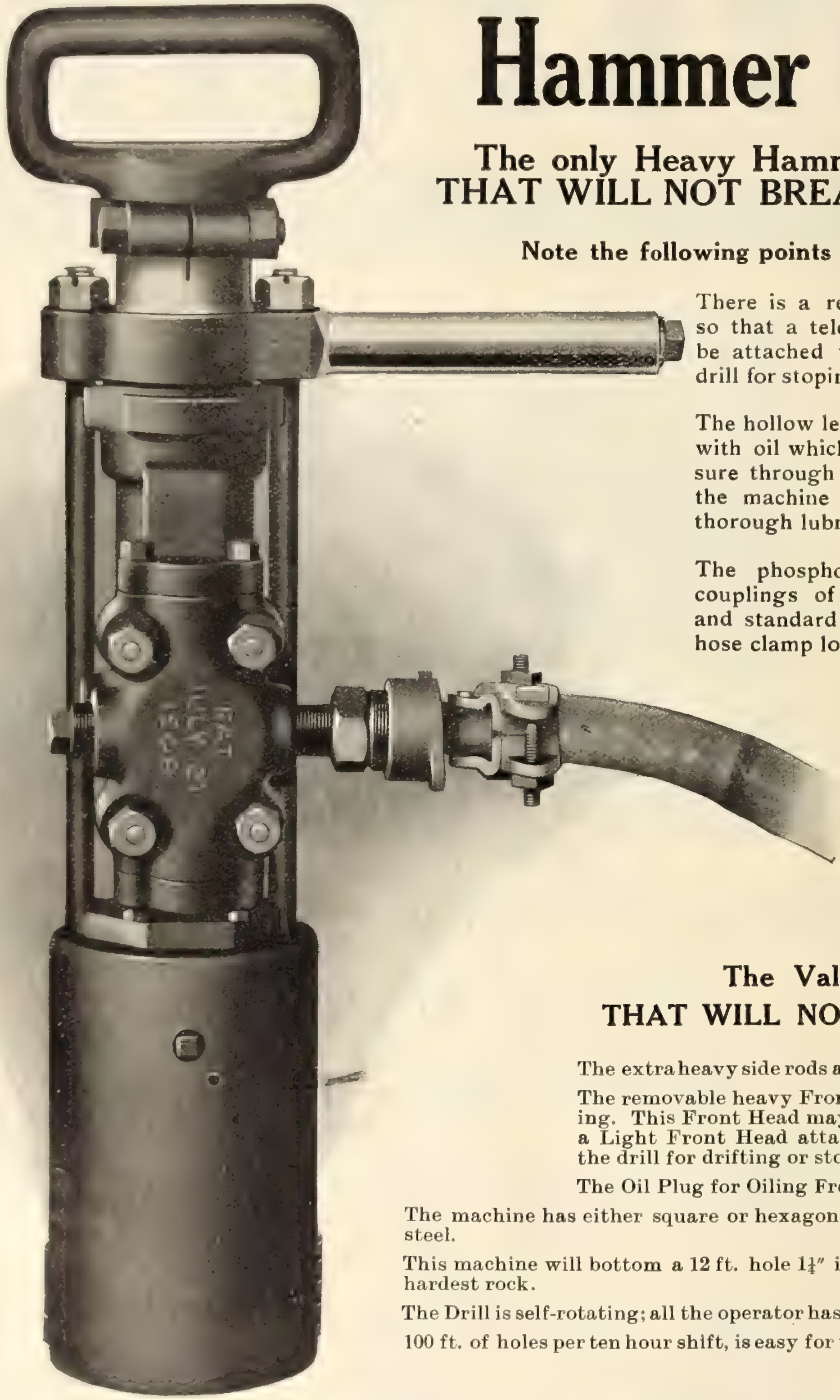

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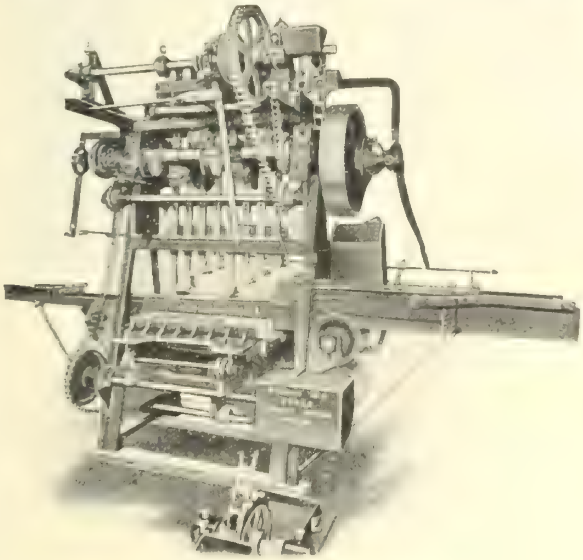

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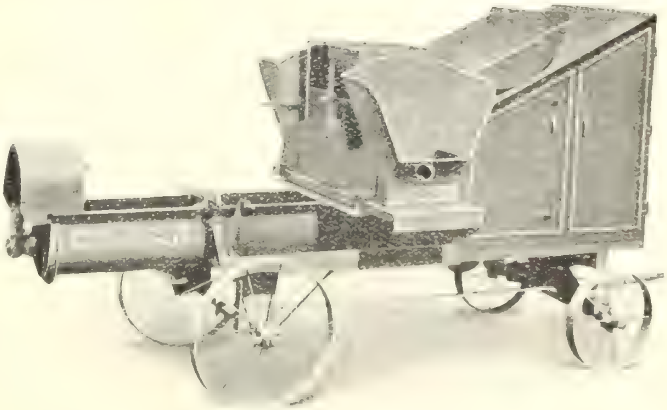

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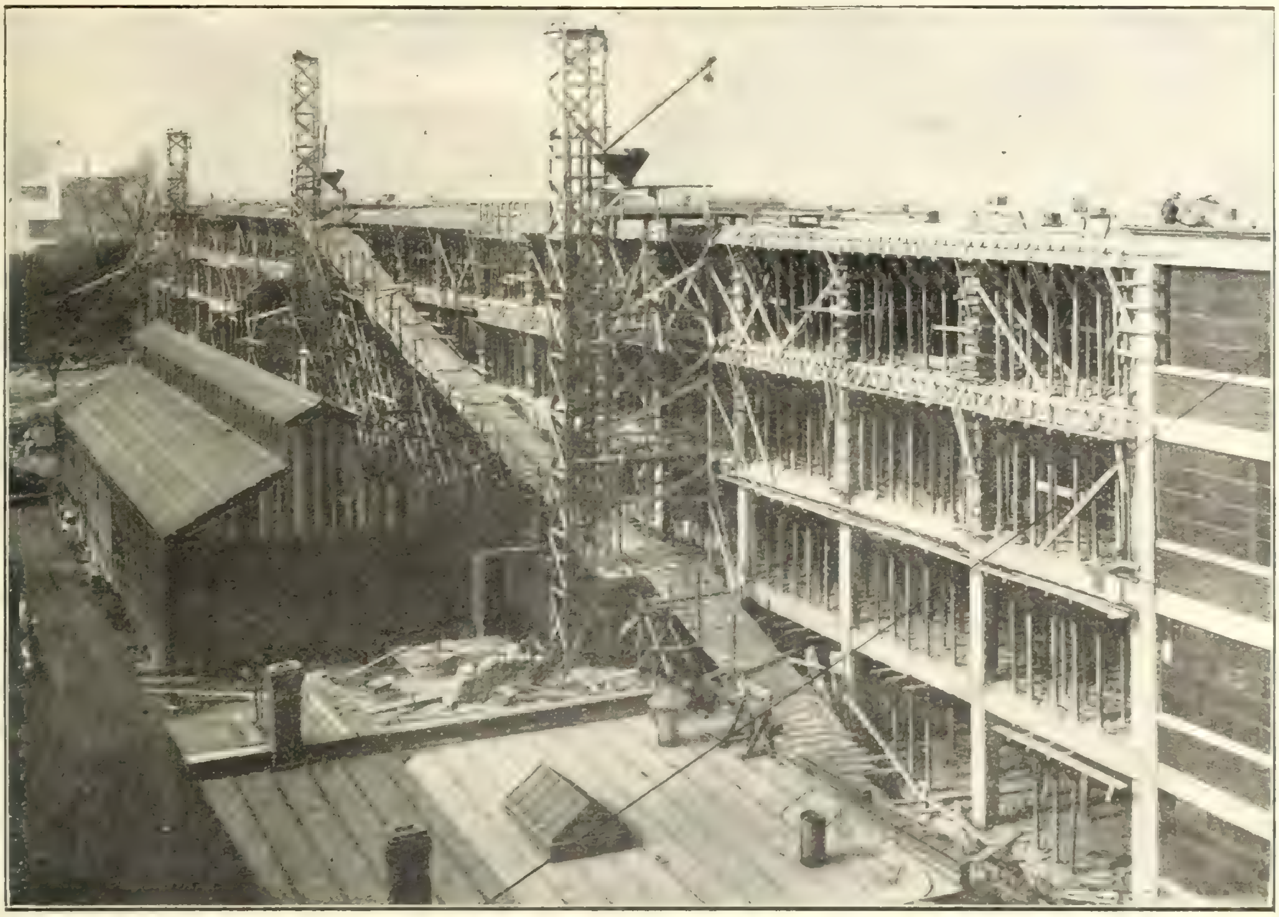

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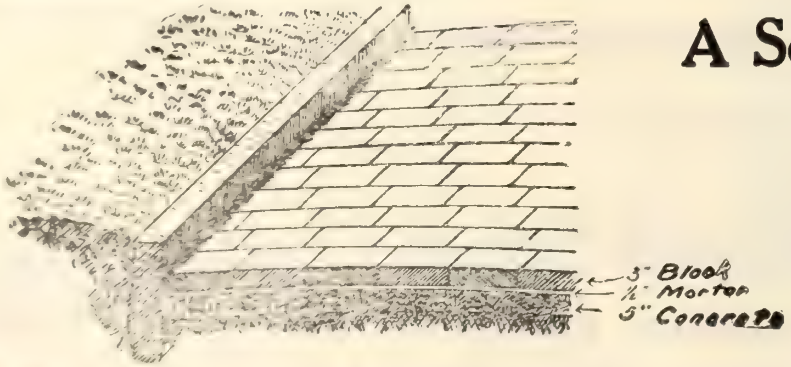

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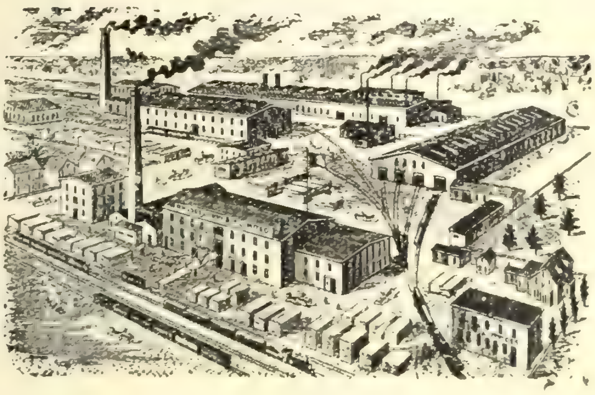

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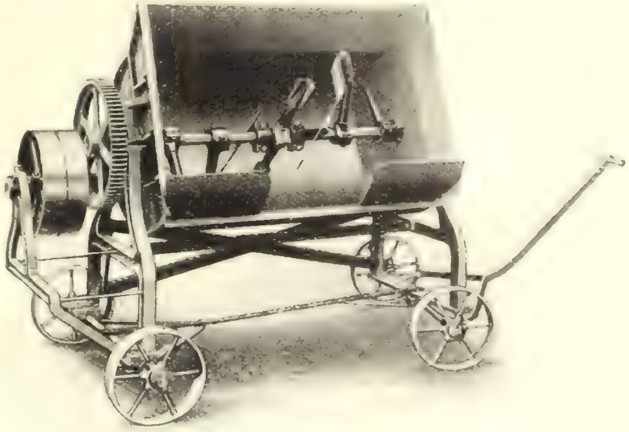

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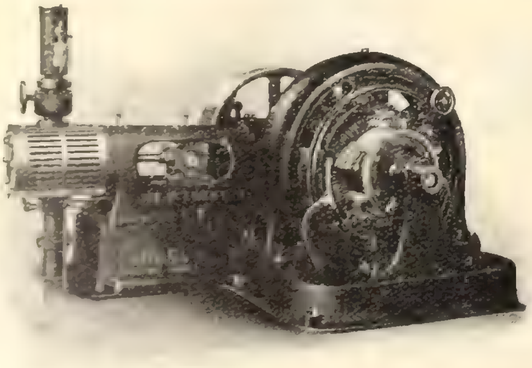

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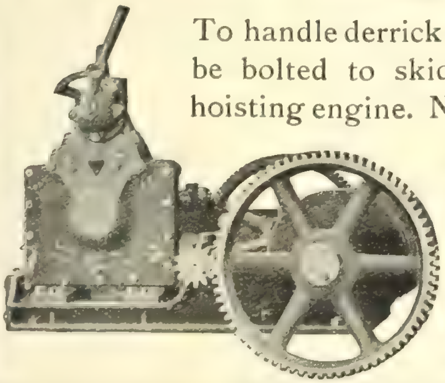

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All Colors with plain or dragged surface or with Matt Glaze.
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BRAND
HILLSBOROUGH, N.B.

It neither loosens nor falls off, it allows carpenters to follow plasterers without loss of time and lasts as long as the building.

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Concrewaltum Paint

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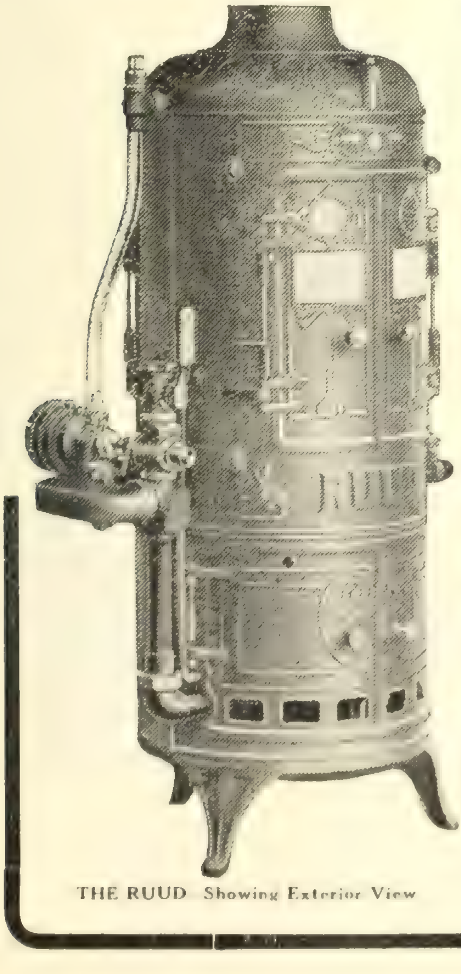

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Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at [illegible]

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	27 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving	36 00	40 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	27 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8 in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 75
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	25
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
85	5 30	8 25
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent.; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock .... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 60 per cent.

Lead Pipe

Lead pipe, $7.50 net, less 10 per cent.; lead waste, $9.00 net, less 10 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 30 per cent.; pig lead, 6½c. lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.04	¼ inch	$2.86
⅜ "	2.04	⅜ "	2.86
½ "	2.72	½ "	3.57
¾ "	3.16	¾ "	4.31
1 "	4.54	1 "	6.19
1¼ "	6.19	1¼ "	8.44
1½ "	7.43	1½ "	10.13
2 "	9.90	2 "	13.50
2½ "	15.80	2½ "	21.56
3 "	20.75	3 "	28.31

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a yard, f.o.b. Toronto siding.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 61c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 58c. per gal. of 9 lbs.

Turpentine, in barrels, 66c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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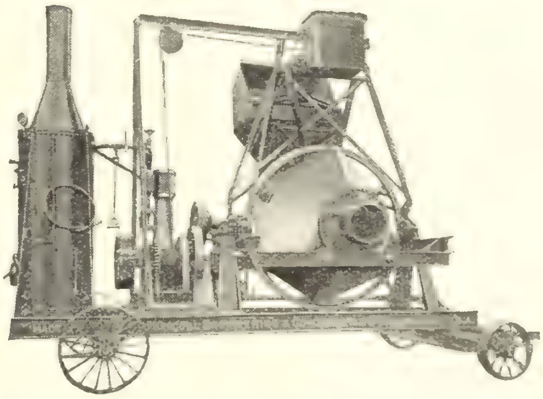
on the Panama Canal Work



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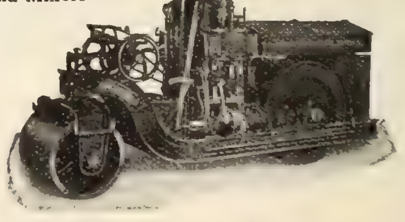

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Not because it is cheaper than other limes but because it has some advantages not found in other brands.

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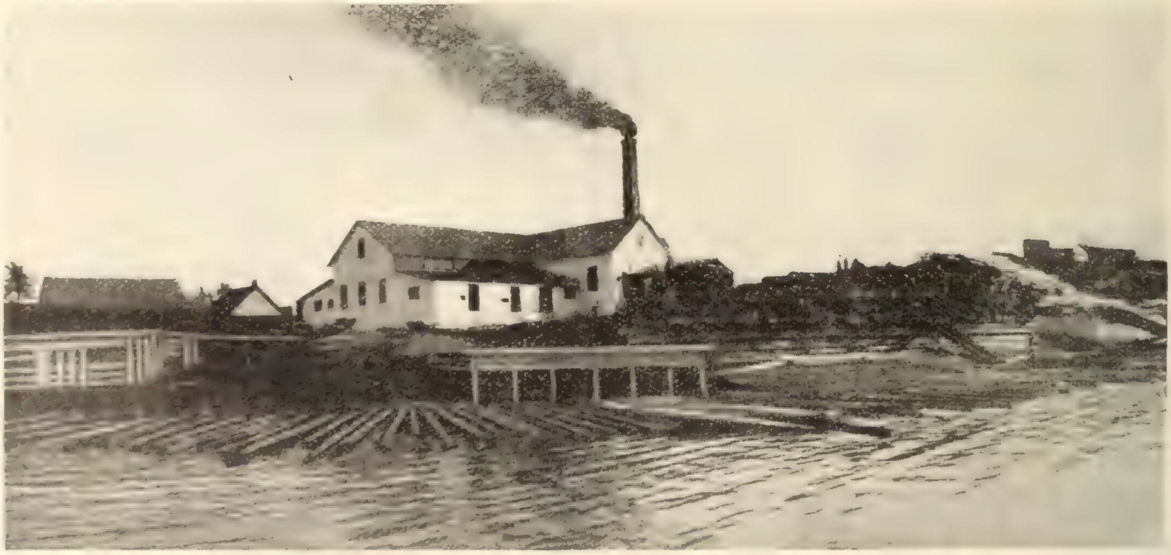

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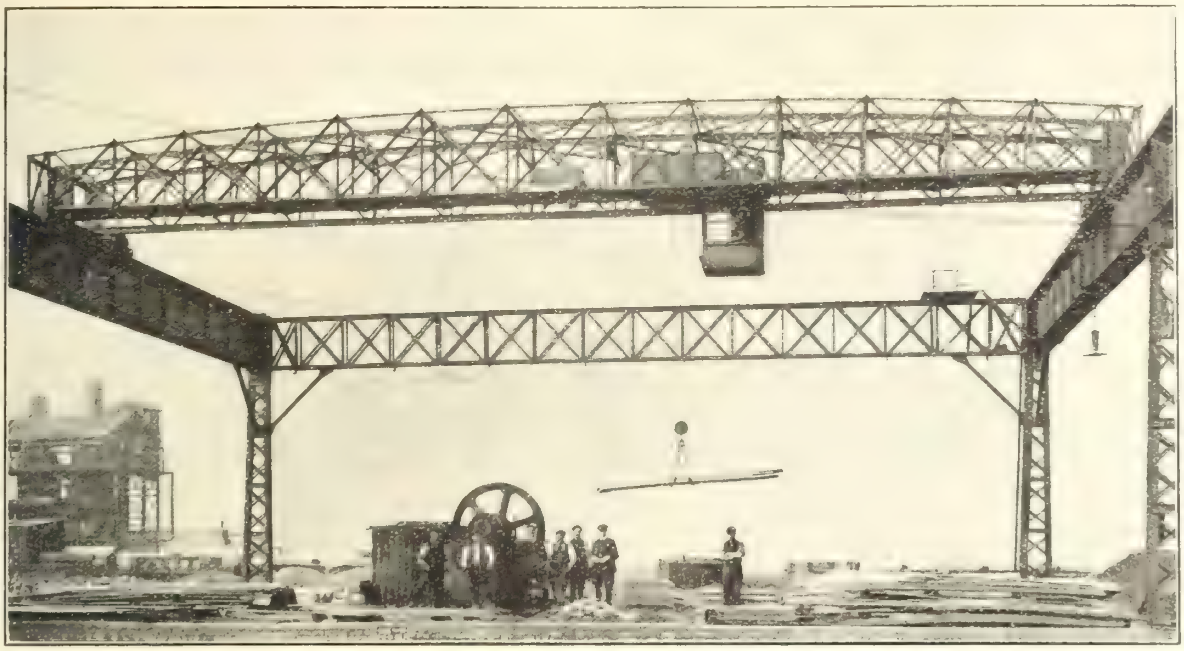

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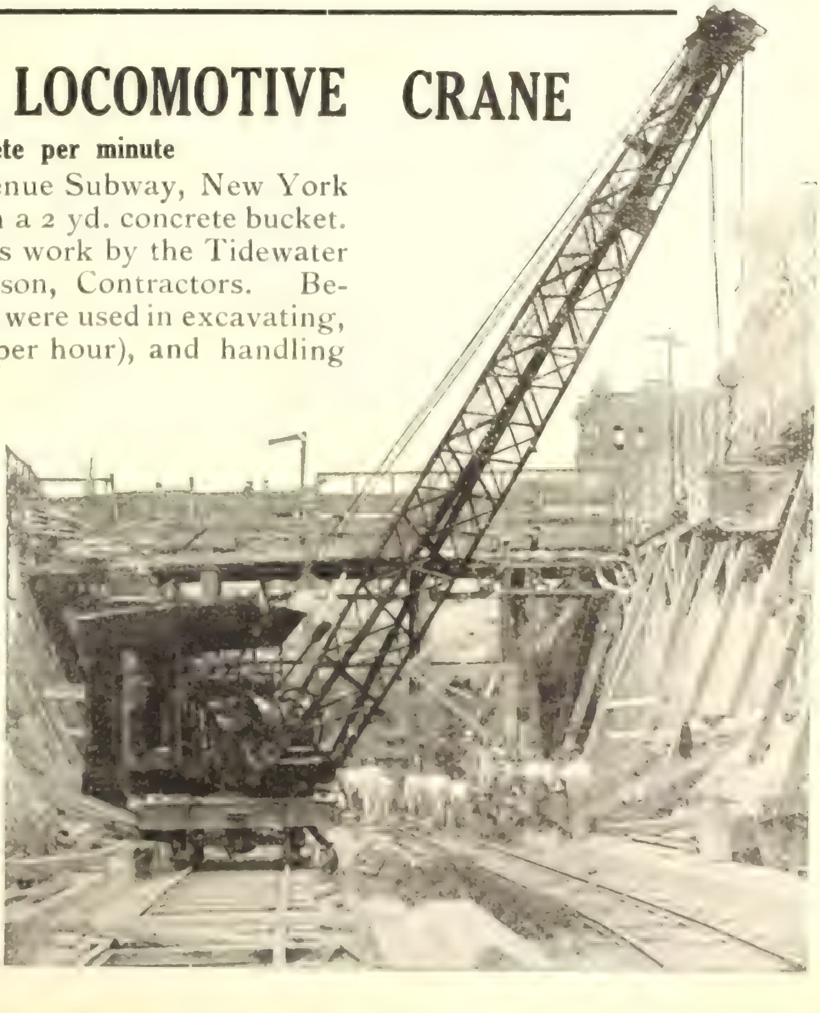
New York Chicago Pittsburgh San Francisco



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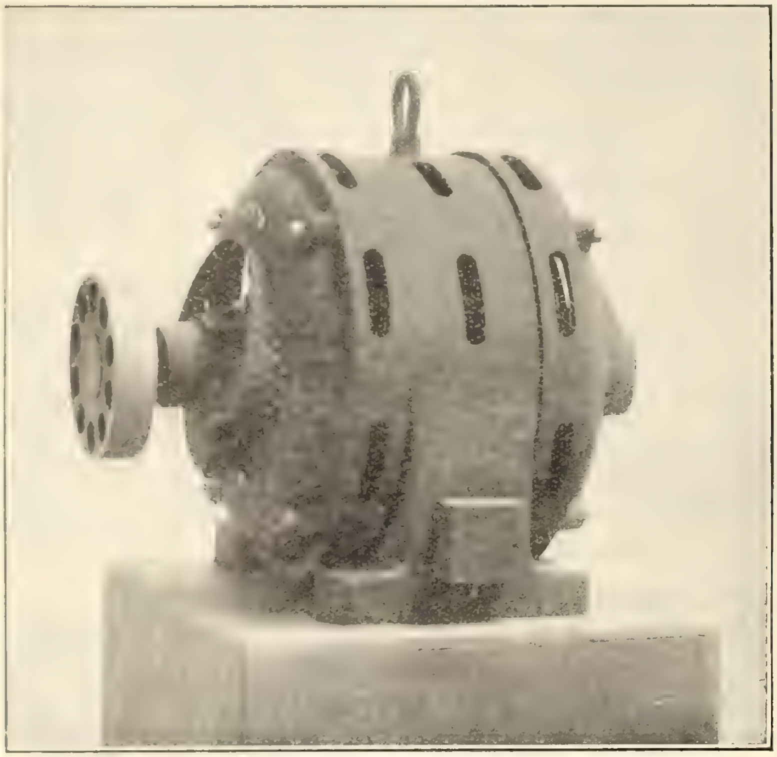

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A Stretcher Brick laid along side the filler brick completing the groove for car wheel flanges and giving the advantage of grooved rails.

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This pavement was laid to secure a test of the wearing qualities of Wood Block.

The street was paved, partly with Asphalt of standard construction and partly with Creosoted Wood Block.

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The guarantee has long since expired on the Creosoted Wood Block but the pavement is as good as ever, the surface wear is scarcely apparent, and it will be many years before repairs are necessary.

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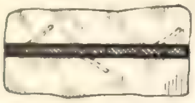
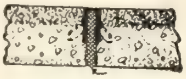


Longitudinal Section Showing Joint.



Cross-Section of Pavement Showing Expansion Joint.

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Wayne County's 70 Miles of Concrete Roads Prove that the Baker Plate Has Solved the Expansion Joint Problem.

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Our new system of installing Baker Armor Plates is simplicity itself, and holds the joint to perfect line and grade.

We guarantee Baker Armor Plates to be perfectly crowned as specified, and entirely free from defects of manufacture.

R. D. BAKER CO., 73 Home Bank Bldg.
DETROIT, - MICH.

Asbestos Corrugated Sheathing

Lessens Depreciation

The sum which must annually be spent on upkeep, and written off for depreciation of buildings can be greatly reduced by the use of Asbestos Corrugated Sheathing.

A Mill, Elevator, Freight Shed, Factory or Warehouse roofed and sheathed with this material presents a practically everlasting exterior, proof against fire and the elements.

Made of two indestructible materials, Portland Cement and Asbestos, this sheathing is not subject to rust or decay, and never requires painting or waterproofing. In fact it grows harder and tougher with age and exposure.

Asbestos Corrugated Sheathing is made in standard lengths of 4, 5, 6, 7, 8, 9 and 10 feet by 27 1/2 inches wide, with corrugations of 2 1/2 inch pitch.

Write for our Booklet No. 9 which shows in detail the methods we have perfected of attaching sheets to wood and steel framing, and of covering ridges and corners.

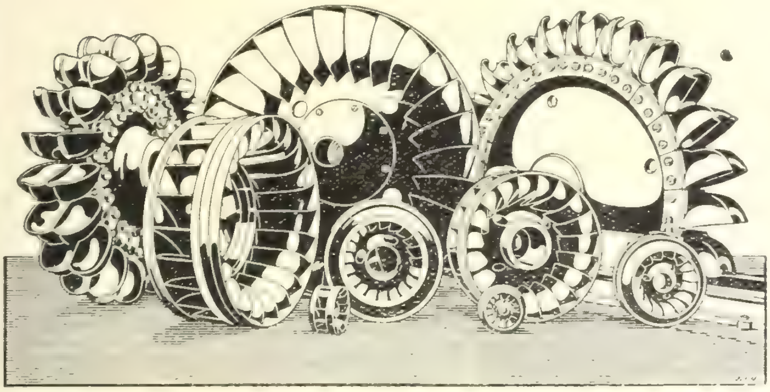
Asbestos Manufacturing Co., Limited

Address E. T. Bank Building, Montreal

Factory at Lachine, Que.
(near Montreal)

ESCHER-WYSS - WATER-WHEELS TURBINES AND IMPULSE-WHEELS

Head Office for Canada
515 Canadian Express Building
MONTREAL, QUE.



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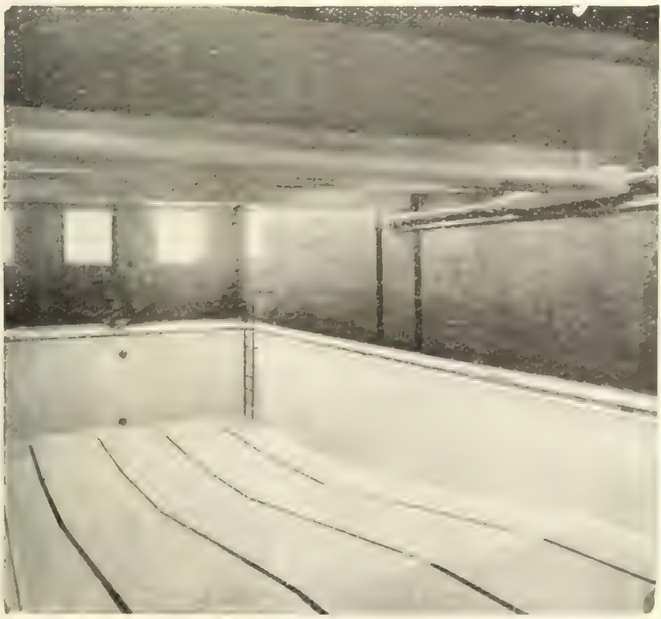
127 Delaware Avenue,
Toronto

Man., Sask. and Alta.
C. L. TRIMINGHAM
45 Canada Life Building,
Winnipeg, Man.

British Columbia
FRANK DARLING & CO
Homer St., Vancouver



Swimming Pool made Perfectly Waterproof with Ceresit Waterproofing

CERESIT WATERPROOFING CO.

Commercial Bank Bldg., CHICAGO.

CANADIAN BRANCHES
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W. K. McDonald Co., Crown Office Bldg., Toronto.
Grose & Walker Ltd., 259 Stanley St., Winnipeg
E. G. Cullen, 418 Pacific Bldg., Vancouver, B. C.
Carritte Paterson Co., Ltd., St. John, N. B.
Carritte-Paterson, Ltd., Halifax, N. S.

Ceresit Factories are located in Chicago, Unna, Westphalia, Germany, London, Paris, Vienna, St. Petersburg.

CERESIT was the only Waterproofing that proved satisfactory

DEFIANCE, OHIO, NOV. 25, 1912.
Ceresit Waterproofing Co., Chicago, Ill.

Gentlemen:

In your last letter you asked us to give our opinion of Ceresit. The biggest job was retaining walls for the Defiance Machine Works between the office and canal. They experimented with other waterproofing but Ceresit was the only one that proved satisfactory. We use it also for plastering "Silos," cement cisterns and numerous other jobs.

DEFIANCE CEMENT WORKS,
John Schlembach, Prop.

"Ceresit" Waterproofing is guaranteed to be a uniform permanent water repellant on any sort of concrete construction and as tunnels, reservoirs, dams, foundations, swimming pools, bridges, viaducts, aqueducts, water tanks and towers, walls, cellars, floors, boiler pits or roofs.

Ceresit is sold all over the world in barrels and five and ten gallon jacketed cans labeled with our name for identification. CERESIT is catalogued in "Sweet's" Index. Agents wanted in unoccupied territory.

Please cut this out

REMINDER

to write for Free Book "S" on how to Effectively and Permanently Waterproof Concrete and Cement Mortar.

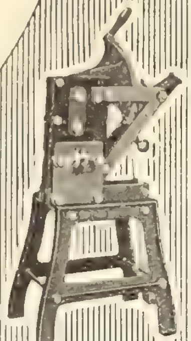
CERESIT WATERPROOFING CO., Commercial Bank Building, CHICAGO

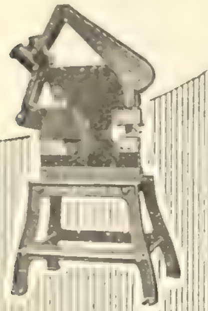
"Buffalo"

Punches Shears and Drills

Among our recent designs is the Bar Cutter No. 10 for cutting concrete reinforced bars—twisted, round or any other shape. It cuts bars up to 1¼" thick and, due to its steel frame, its **weight is only half** that of a cast iron machine of the same capacity. Ask for catalog of Steel Punches, Shears and Drills No. 145.

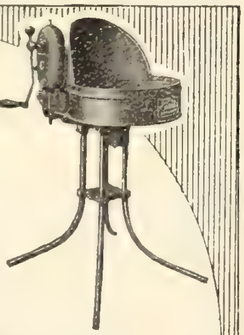
Canadian Buffalo Forge Co.
MONTREAL Limited
St. John Winnipeg
Toronto Vancouver





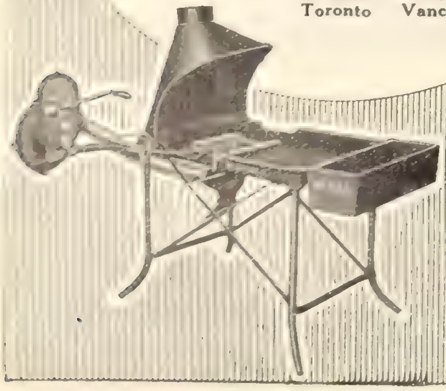
"Buffalo" **Forges**

"Built to Last"



is the slogan of our **1912 Rivet Forge.** The repair cost by this design is guaranteed to be actually **cut in two,** compared with any other forge now in the market. A bridge company using a large number of forges writes us regarding it: "The operator claims it runs easier and heats more rivets in less time than any forge he has ever used." Let us send you one on free trial. Fifty other styles, for light and heavy work.

Canadian Buffalo Forge Co.
Limited
Montreal
St. John Winnipeg
Toronto Vancouver



Structural Water-proofing

"Membraneous Method"

An essential characteristic for materials under this heading is **ELASTICITY**—ability to withstand contraction or expansion of the structure.

Our **Dehydratines** fulfil this requirement.

"The Integral Method"

Water-proofing concrete by incorporating the compound with the cement.

Hydratite, in either paste or powder, really **water-proofs** concrete.

Symentrex—"King of Cement Coatings"—for concrete floors and all masonry surfaces. In colors and waterproof.

Symentrin—Interior Flat Wall Finish.

"Ferro-Fax"—"The Ferrolithic Method"—for dust-proofing concrete floors and making them traffic resisting.

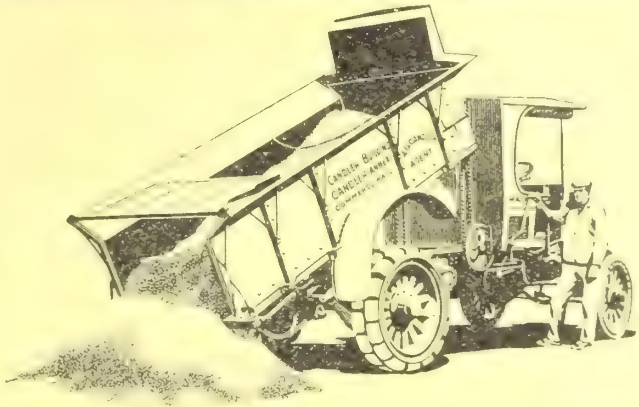
Requires only 5% (five) by weight of cement to secure results.

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto

Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

For 15 years standard of their kind



MACK

A Mack Truck That Replaced Five Double-Teams In Winnipeg

The five-ton Mack Dumping Truck shown here is owned by the Lake Winnipeg Shipping Company, Limited, and it has replaced five double teams, the service of which teams would cost approximately $30.00 per day. This truck is engaged in hauling gravel, sand and rubble from the docks to various points throughout the city. The heavy mud which forms on the unpaved roads after rainfalls does not interfere with its operation.

We have records of hundreds of five-ton Mack Trucks that are earning from $30.00 to $50.00 per day.

Mack Trucks have proven their reliability, economy and long life by 12 years of real service in every line of transportation.

You should investigate the Mack before buying a truck. Ask us to show you.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

ADANAC RED CORE RUBBER COVERED WIRES AND CABLES

RUBBER COVERED TRADE ADANAC MARK WIRES AND CABLES

Are made according to the specifications of the National Board of Fire Underwriters. The conductors are drawn from copper of the highest conductivity and are covered with two thicknesses of thoroughly vulcanized rubber compound of high quality. The wires are braided over insulation and the smooth high finish they receive makes them specially desirable for conduit work.

IMPERIAL WIRE AND CABLE COMPANY
Limited
MONTREAL

The Northern Electric and Manufacturing Co. Limited
Sales Agents

TORONTO REGINA WINNIPEG
CALGARY EDMONTON VANCOUVER

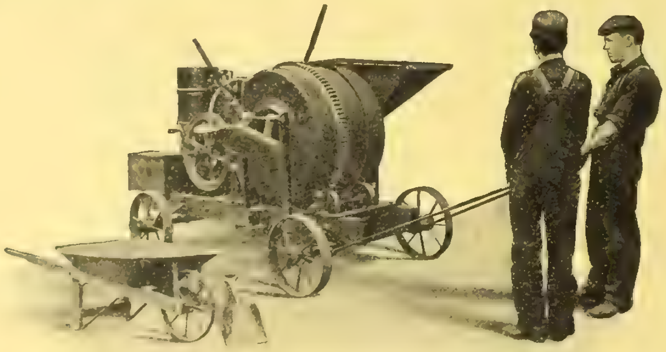
Everybody Who Builds

Concrete Walls, Concrete Walks
or Curbs, Concrete Anything

can have the best Concrete that can be made at the least possible cost

BECAUSE

Our No. 4 RANSOME MIXER



No. 4 Ransome Concrete Mixer.

is the equal of our larger machines in efficiency and is sold at a price which makes it an easy and a wise purchase for anybody.

It has a batch capacity of 4 cubic yards per hour, which is ample for any small concrete job. No. 4 Mixers are sold in one way only : i. e.—mounted on Trucks, with gasoline engine, direct drive. This is a powerful engine for its rated H. P. and the best designed—a most perfect operating engine.

The No. 4 Ransome is a great time saver in every respect. As we equip these machines with a special batch charging hopper, which is being filled while the batch in the drum is mixing—no time is lost in charging drum. By the simple lever arrangement, the whole unmixed batch is fed into the drum in an instant and the loading gang keeps right on with their work without any waits whatever. The batch is instantly discharged by merely reversing the discharge chute.

Let Us Send You Particulars

F. H. Hopkins & Co.

MONTREAL

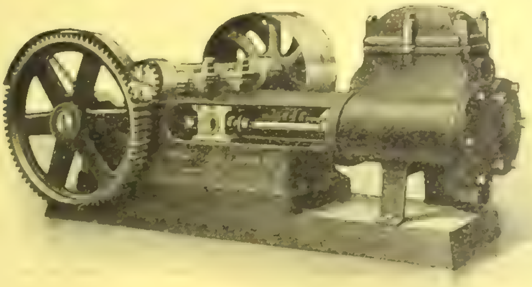
BRANCH OFFICES: **General Supply Company of Canada, Ltd., Winnipeg Agents**
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, April 23, 1913 No. 17

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps,
Condensers, Travelling Cranes



The Smart-Turner Machine Co.
LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

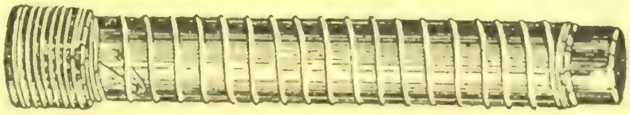
Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works : 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

- Simplicity of Design
- Noiseless Running
- Compact Design
- Low Oil Consumption
- Continuous Operation
- Overall Efficiency

Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL

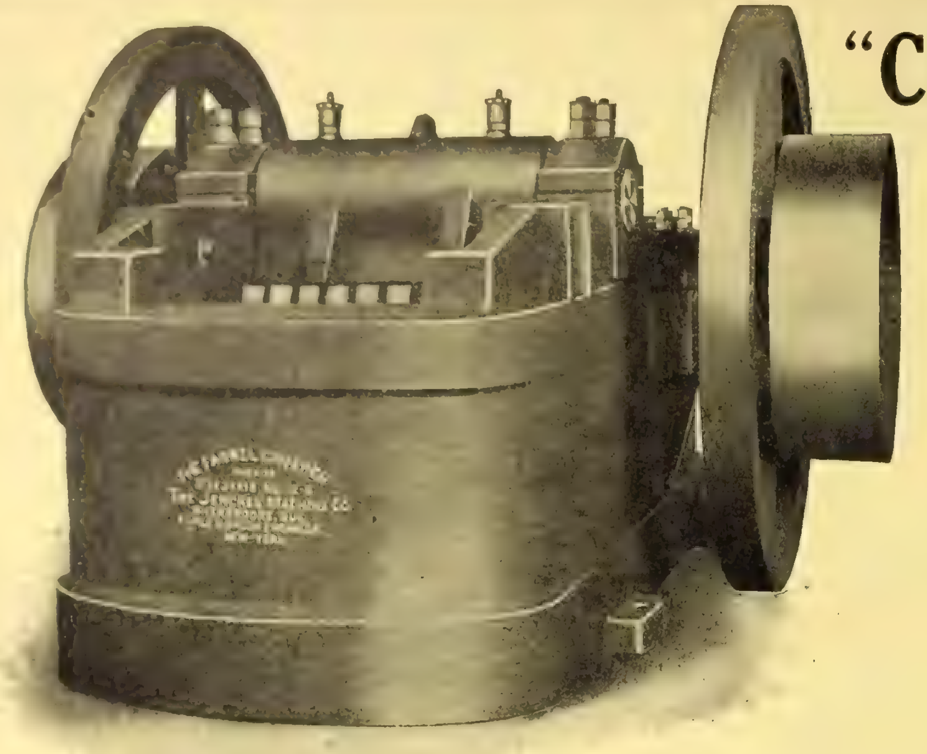


Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



"CRUSHERS"

Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. Works: Sherbrooke, Que. - St. Catharines, Ont.

Sales Offices:—Sherbrooke, Montreal, St. Catharines, Cobalt, So. Porcupine, Vancouver, Nelson

PUT THEM

into the hardest kind of service

"AMERICAN"
Wire Rope Blocks

will prove their makings and materials every time.

They will safeguard the lives of your men, your expensive material and your equipment.

They cost no more than the cheap kind but they're worth more.

American Hoist & Derrick Company, ST. PAUL, U. S. A.

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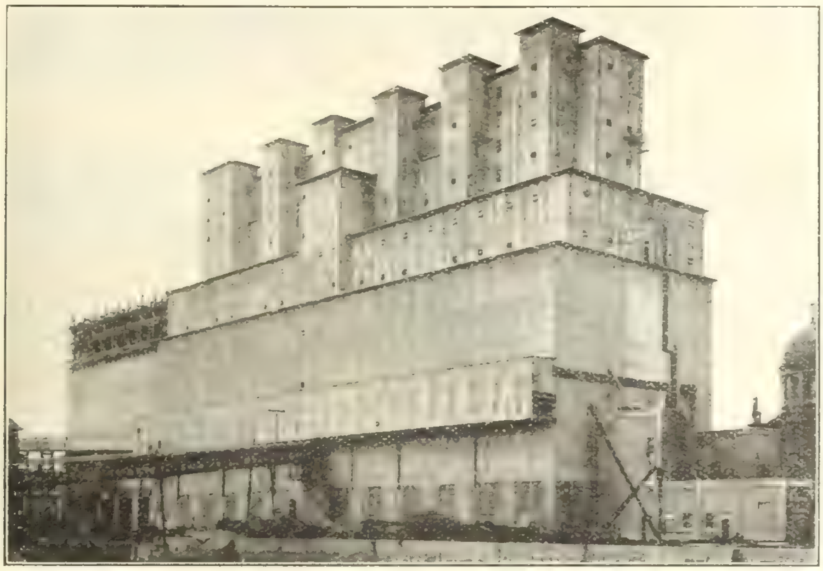
Vancouver Machinery Depot, Ltd., Vancouver, B. C. Stuart Machinery Co., Winnipeg, Man.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.



Built of Canada Cement

The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

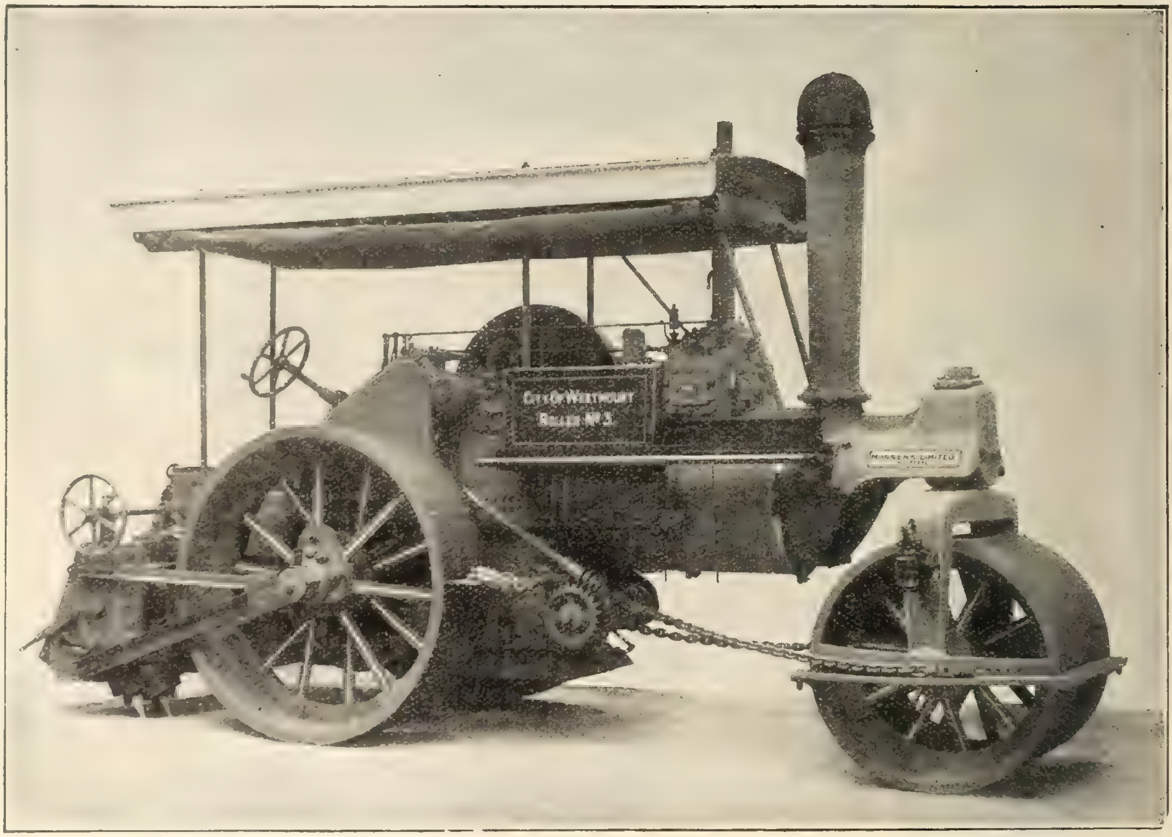
Canada Cement Company
Limited
Montreal

SALES OFFICES
Montreal Toronto Winnipeg Calgary

RUSTON - PROCTOR

Compound Cylinder Road Rollers

Combine many features which you should
investate before buying

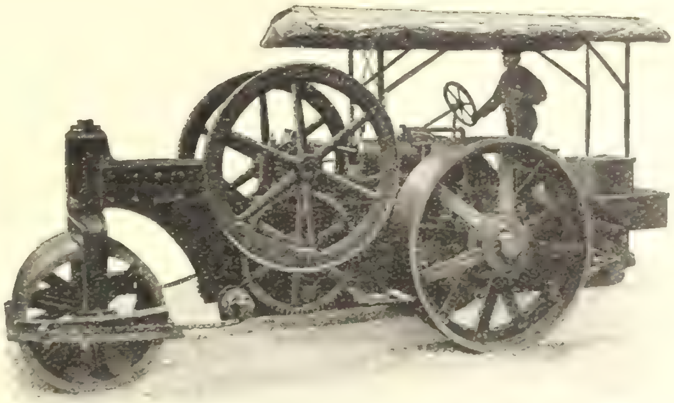


They are designed and built especially for the Canadian roads. They incorporate a correct distribution of the weight on front and rear axles—Renewable rims to front and rear rollers—Patent Spring Scrapers---Improved fore-carriage, self-adapting to uneven roads---etc. Catalogue on request

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

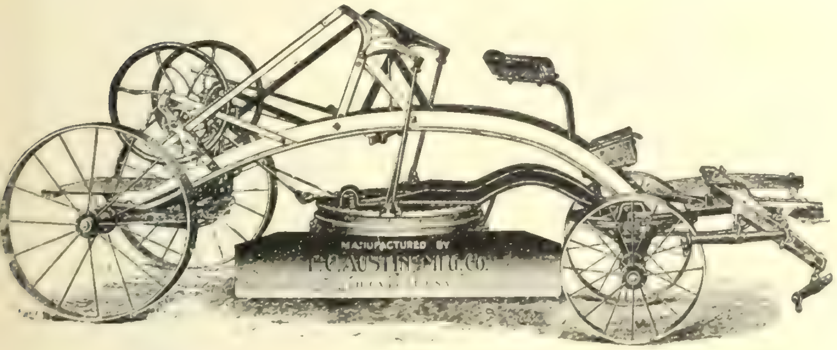
MOTOR ROLLERS



Are always ready for work.
They are noiseless in operation—
Easy to handle—No smoke.

Made in five sizes - 7, 8, 10, 12, 15 tons.

They also furnish power to operate rock crushers or other machinery.



AUSTIN ROAD GRADER

Has a direct draft—Pulling the blade, not pushing it. It is not liable to injury from running into boulders and roots or in working the driest and toughest of hard scrabble roads.
The wheel levers are powerful and quick in their action also simple and easy to operate.

Ask for further particulars

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Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

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- Escher Wyss & Co.
- Canada Foundry Co.

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- Metallic Roofing Co.
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- Browning Engineering Co.
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- Campbell, R.
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- Hancock, H. Syd.
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- American Water Softener Co.

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- Smyth & Ryan

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- Metal Shingle & Siding Co.
- Mussens Limited
- Ormsby, A. B.
- Steel & Radiation Ltd.

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- Lecky & Collis

Forges
- Canadian Buffalo Forge Co.
- Sheldons Limited
- Canadian Sirocco Co.

Furnaces (Special)
- Improved Equipment Co.

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- Improved Equipment Co.

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- Improved Equipment Co.

Gas Machinery
- Improved Equipment Co.

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- Hobbs Mfg. Co.
- Luxfer Prism Co.
- Toronto Plate Glass Imp't'g Co

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- Canada Iron Corporation
- Gartshore-Thomson Pipe Co.
- Kerr Engine Co.

(Continued on page 12)

Don Valley Clay Products

For over twelve years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Lumsden Building, Toronto
J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.
Don Valley Fireproofing, Bricks and Tile used throughout.

Traders Bank, Toronto
Carrere & Hastings and F. S. Baker, Associate Architects.
Don Valley Porous Terra Cotta Fireproofing and 2,0000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

Royal Bank, Toronto
Eustace G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.
Don Valley Porous Terra Cotta Fireproofing and Brick used.

Bell Telephone Building
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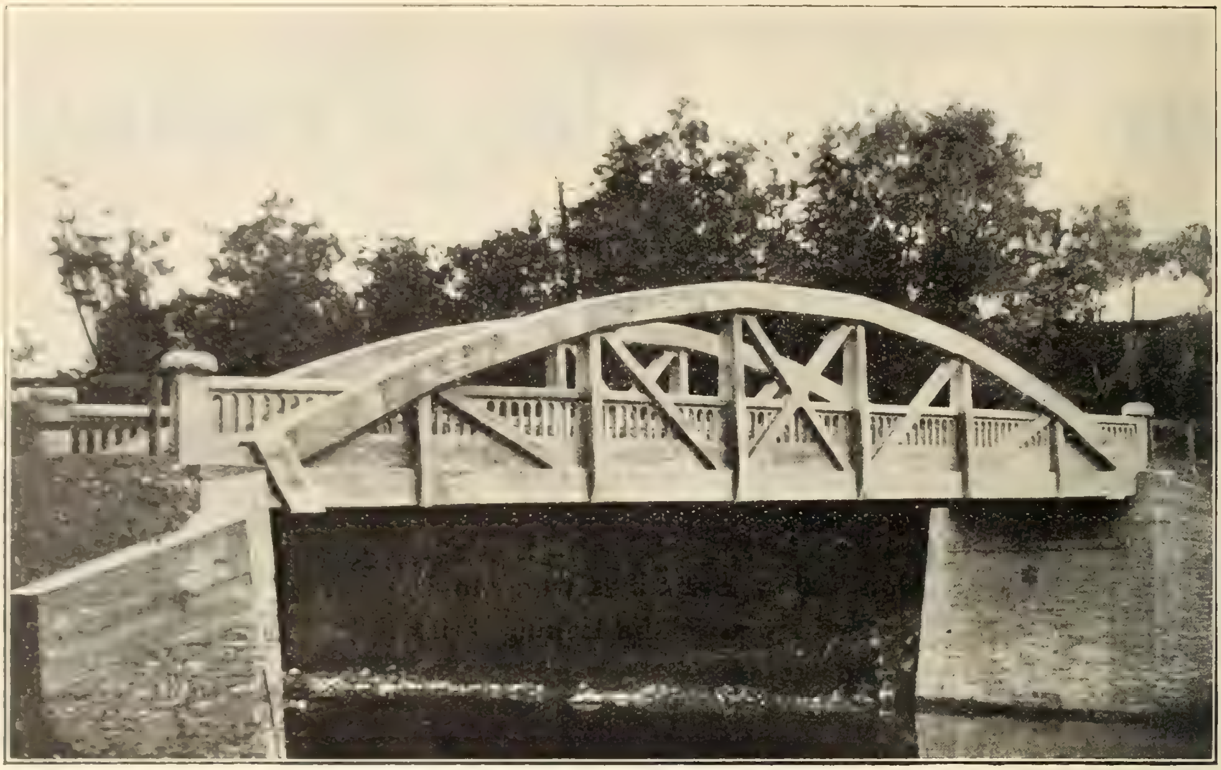

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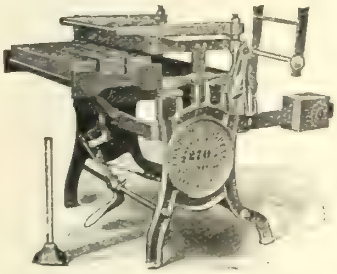

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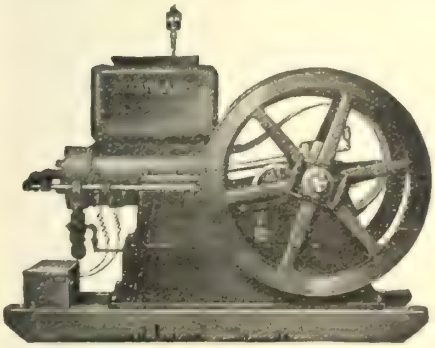

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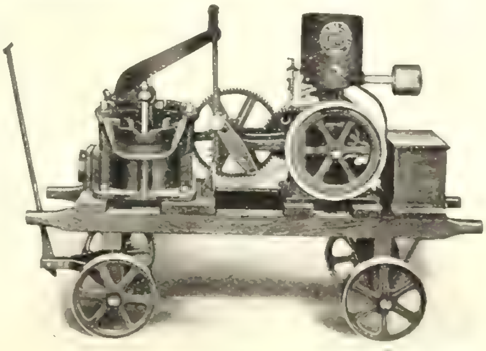

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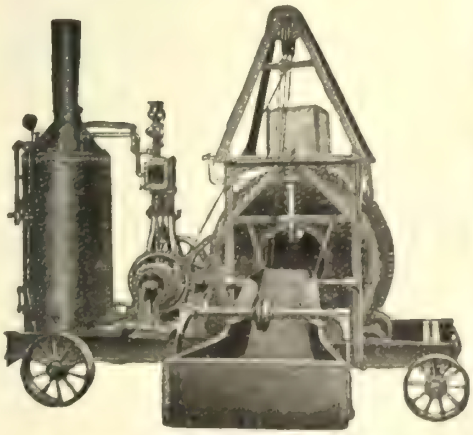

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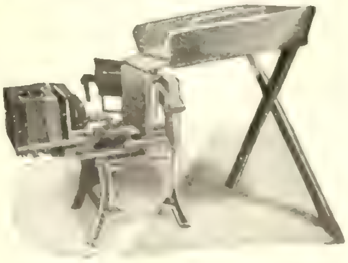

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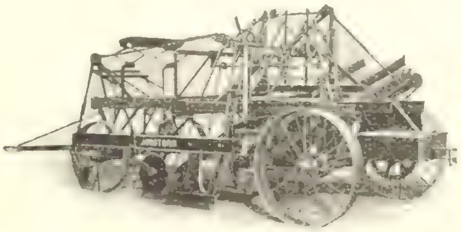

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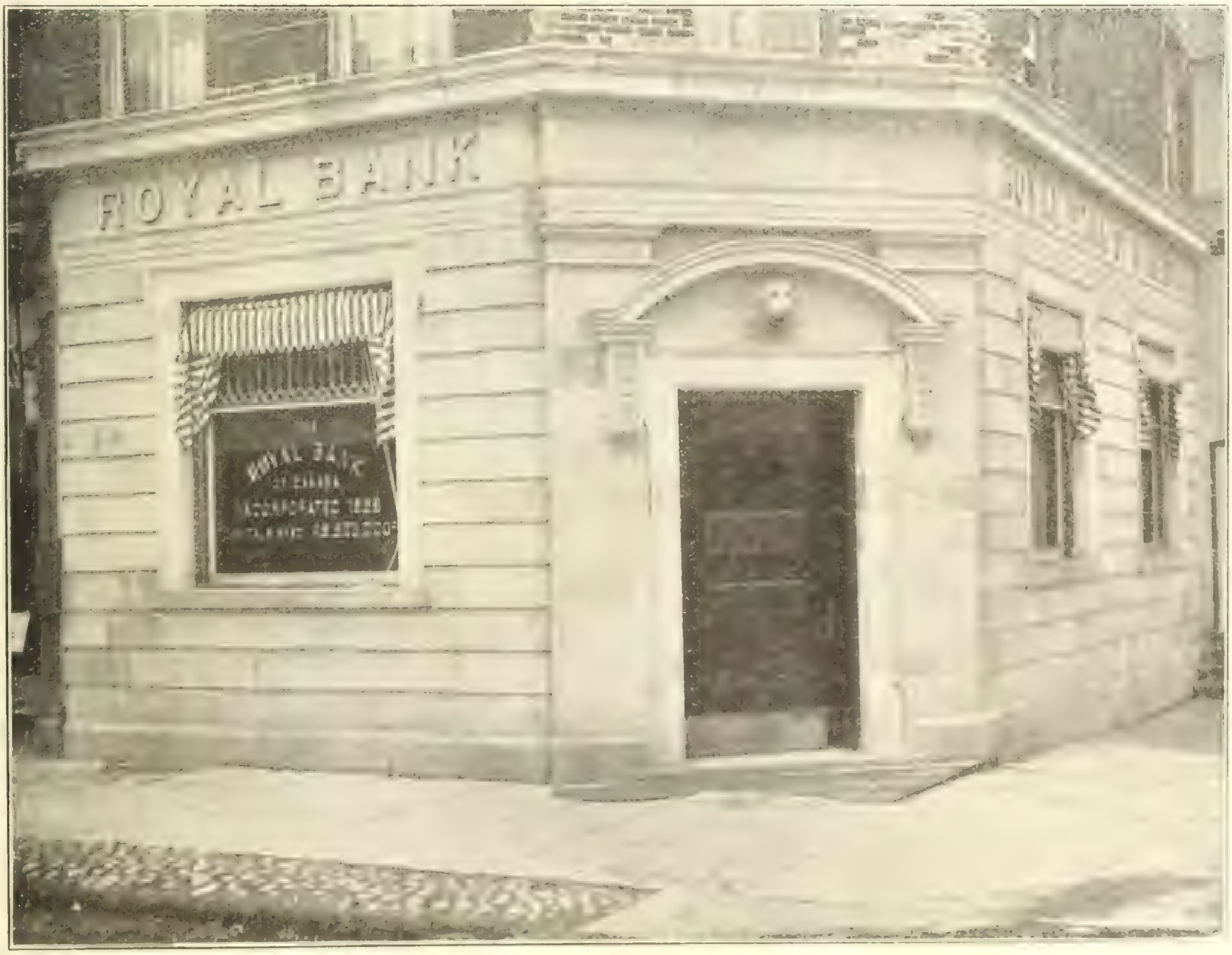

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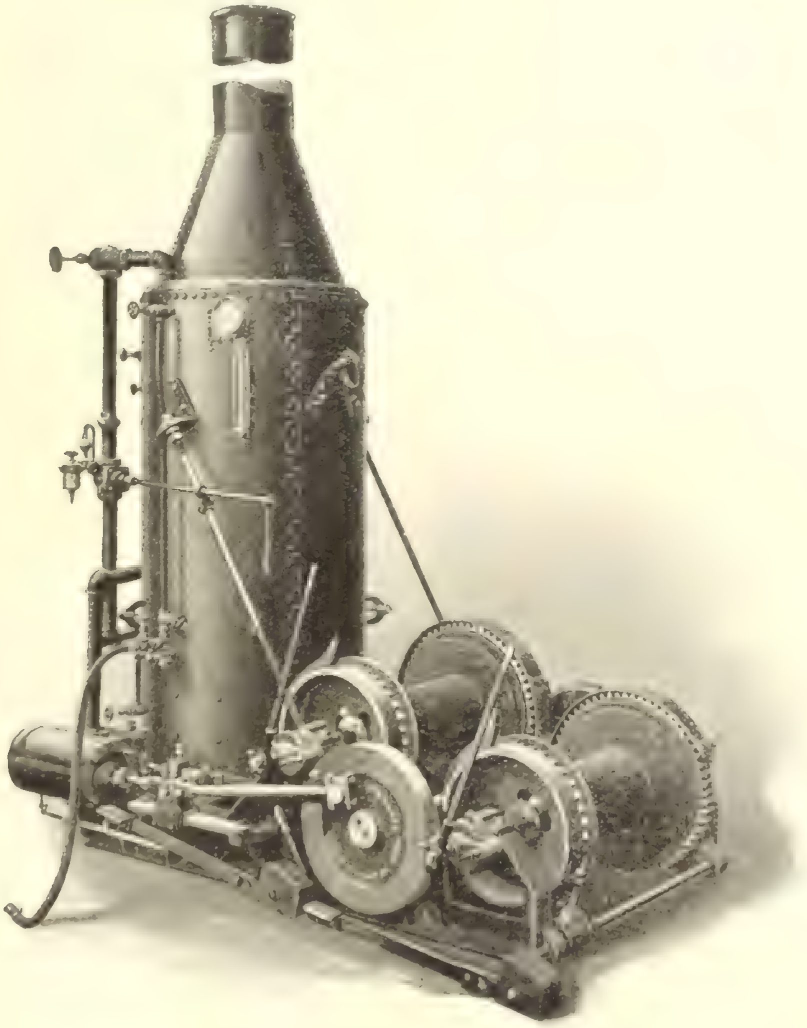
If you wish to **know why** the Napanee Hoists are so superior in design, material and workmanship, write us for information and we will be glad to send you specifications and details and to refer you to actual users so that you can **judge for yourself.**



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Address

Town

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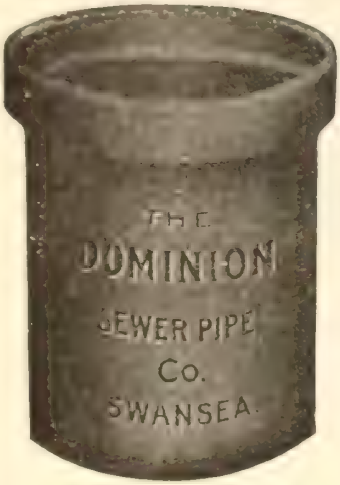
Salt Glazed and Vitrified

SEWER PIPES



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Impervious to Water.

Sizes manufactured and always in stock 4 in. to 24 in.

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Chimney Tops
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TELEPHONE (Toronto Connection)
PARK 1809

The Dominion Sewer Pipe Co.

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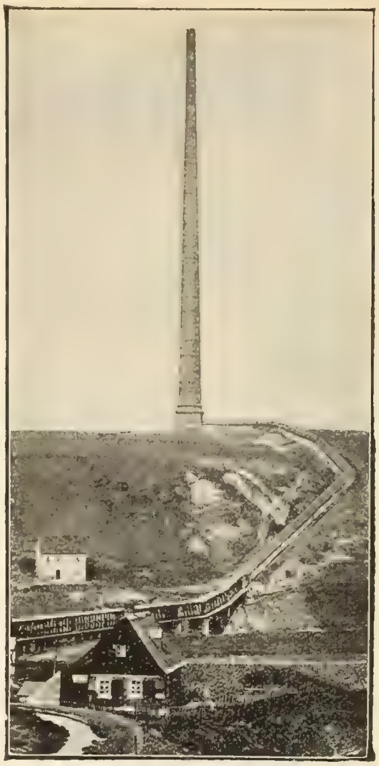

460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

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will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a **HEINICKE.**

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Representatives for Canada:
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VITRIFIED AND VERIFIED

ROUND PIPE AND SQUARE DEALING
[illegible] to 24 in.

Vitrified Salt-Glazed Pipe and "Mimico" Brand Pipe

are

Synonymous Terms

Why experiment with inferior ware when you can get the best at little extra cost?

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Councilmen and Engineers is it worth while to take chances?

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Agents for Patented Vitrified Segment Block for Sizes over 24 inch

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Vitrified Hollow Building Blocks

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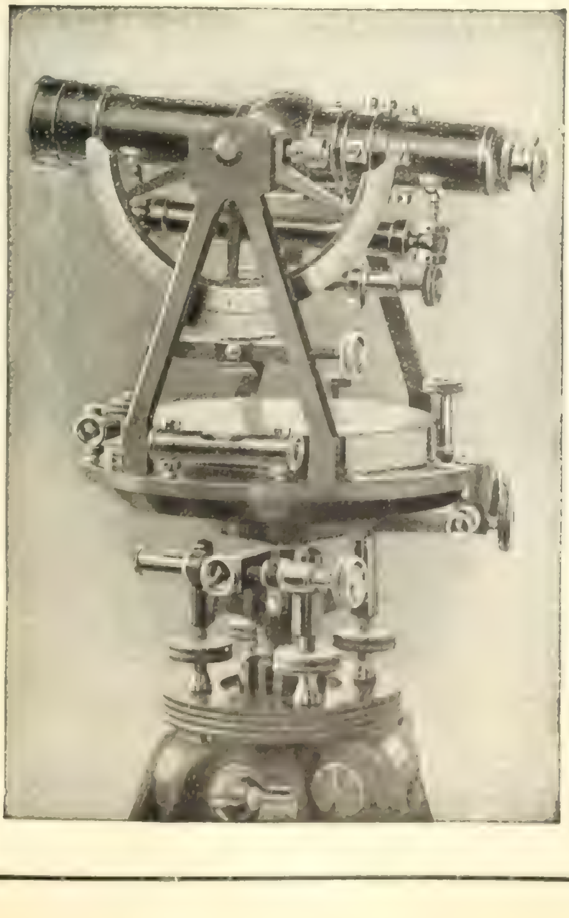

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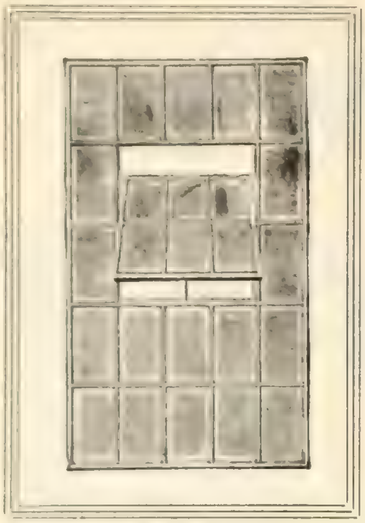

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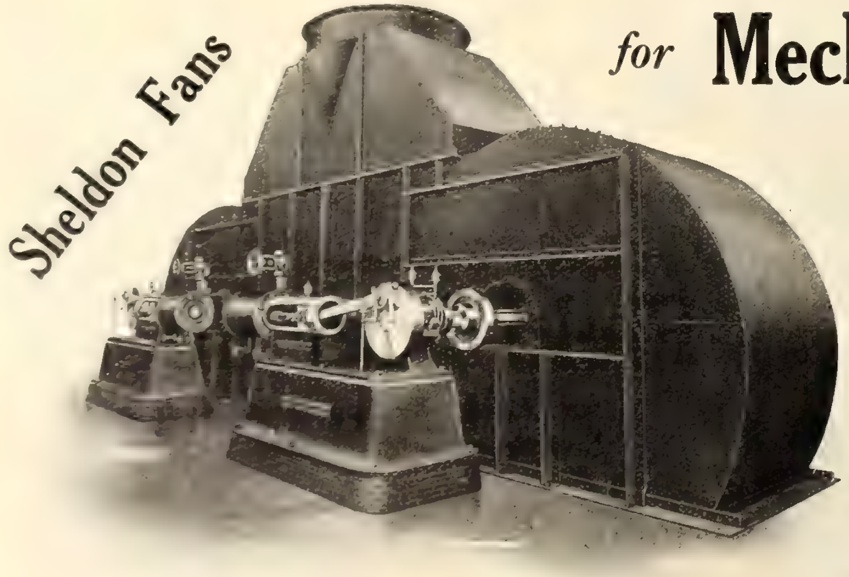

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Non-Freezing and Fumeless

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Non-Freezing and Fumeless

These High Explosives are rapidly superseding nitro-glycerin dynamite as blasting agents for work requiring powerful explosives, not only because of the greater economy and safety due to the complete elimination of the dangers and expenses attending the thawing of explosives, as well as the expense and annoyance due to noxious fumes or gases causing disabling headaches, but largely to the fact that long experience in the use of our explosives, by many of the leading railroad construction contractors, quarrying, mining and other concerns, has proven that blasting operations of any kind whatever can be carried on with far greater economy than was possible four or five years ago, when our Non-Freezing, Fumeless High Explosives were first placed on the market.

Points to Consider

They do NOT Freeze and Produce NO Noxious Fumes.

Contain NO Nitro-Glycerin, Chlorate of Potash, Picric Acid nor Gun-Cotton.

Can be stored, handled and used with greater safety, convenience, and economy than other High Explosives, and can be stored in any dry, ventilated building indefinitely without deteriorating from age.

Will do all kinds of blasting work that can be done with nitro-glycerin dynamite or any other kind of powerful high explosives of a standard make.

Can be detonated, and will develop their full power, with any No. 6 Cap or Dougle-strength Electric Exploder of a standard make.

Correspondence solicited. It will be to your interest to communicate with us and receive and consider our bids or quotations before closing any contracts or placing orders with other manufacturers of, or with dealers in, High Explosives.

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Works: Sand Point, Canada **General Offices: 75 Sparks St., Ottawa, Canada**

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For Limestone, Marble and Sandstone

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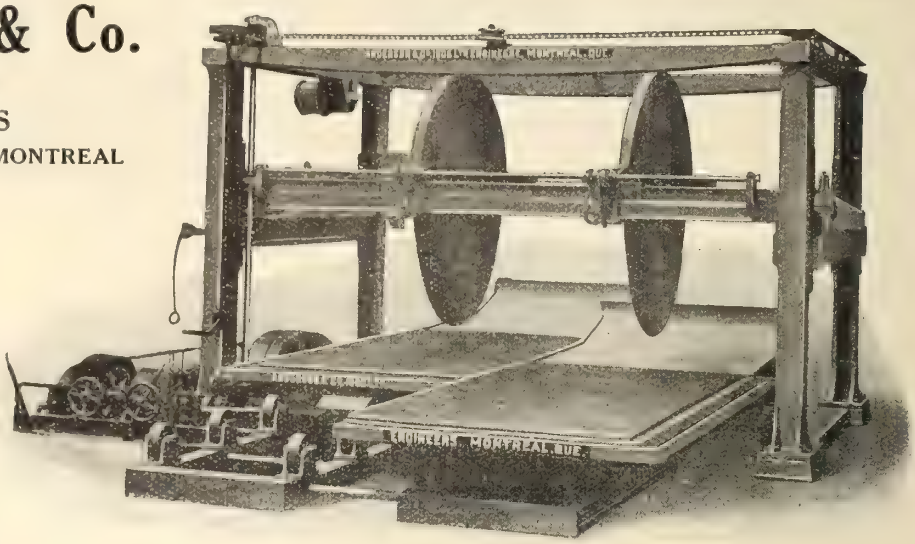
10 H. P. to 150 H. P.



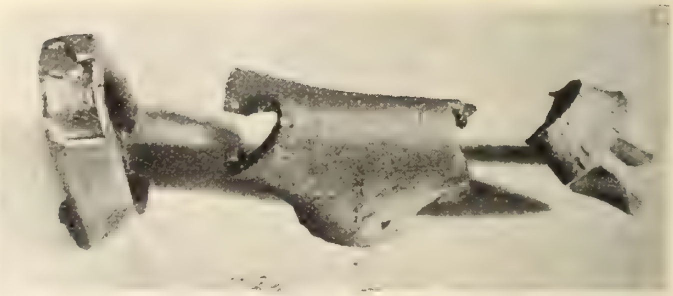
Anderson's Rising and Falling Diamond Saw, made under British and U. S. A. Patents 209179, 657262 SINGLE AND DOUBLE TABLES

About 50 of the above Machines at work in Canada

The evidence of the Overwhelming Superiority of the new Sherardized Coating on

Herringbone Metal Lath

does not depend on the statement of any interested party.



Effect of bending on Galvanized Coatings, magnified six diameters.
A Hot Galvanized Coating.
B Sherardized alloy, zinc dust removed.
C Electro galvanized coating.
Note ability of Sherardized coating to withstand bending.

Read the extract from the Report of Prof. Burgess, Metallurgist, of the University of Wisconsin.

"In a series of tests it was shown that 0.1 gram of Sherardized coating material from an iron article, dissolved in a normal sulphuric acid in 304 minutes. Zinc from an electro galvanized coating dissolved in 50 minutes. Powdered zinc from a hot process bath dissolved in 20 minutes.

Why specify Herringbone Sherardized Lath "or equal"?

There is no equal and the price of the Sherardized coating competes with the cheapest galvanizing.

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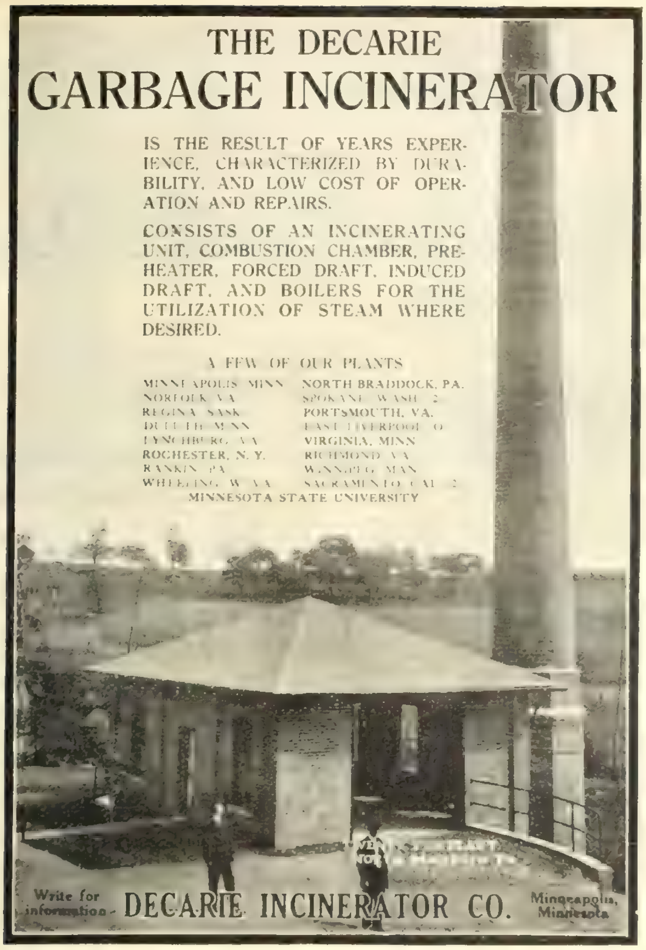
Metal Shingle & Siding Company, Manufacturers



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GARBAGE INCINERATOR

IS THE RESULT OF YEARS EXPERIENCE, CHARACTERIZED BY DURABILITY, AND LOW COST OF OPERATION AND REPAIRS.

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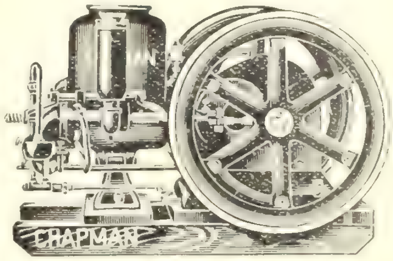

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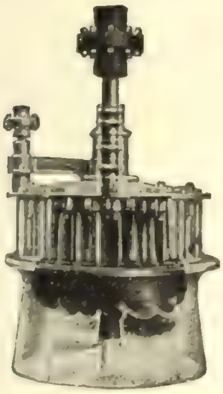
Limited
Toronto - Winnipeg - Calgary



The Samson Water Wheel

Wherever a water wheel can be used, the Samson wheel will give complete satisfaction, and wherever efficiency is an important factor, there the Sampson wheel will give the best possible service, because it has shown as high percentages of efficiency as 80%. These results have never been surpassed in official tests by any turbine water wheel.

It is easily installed, and when in operation is easily controlled.

The Samson wheel is always sold on an absolute guarantee.

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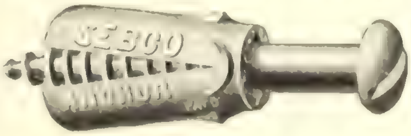
Use SEBCO
Expansion Bolts and Screw Anchors
for making fastenings to brick, concrete and tile—you will save time and expense.

SEBCO PRODUCTS

Sebco Products may be had from dealers everywhere; they are made of malleable iron, brass and of lead composition; in all sizes from 1/8" to 2" in diameter.



Sebco is specified on much Government work and by the most prominent Architects and Engineers.

We also manufacture a complete line Toggles, Concrete Inserts Drills and other fastening devices.

Star Expansion Bolts
J. Edward Ogden, Canadian Distributor
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We make
20 lb. Section Rails
25 " " "
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RAILS

60 Tons 25 lb. Rails, Ready for Shipment
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We hold stocks of
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80 " " "

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Cold Twisted Squares for Concrete Re-inforcing made from New Steel Billets only.

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Road Graders, Rock Crushers, Portable Engines, Steam Road Rollers, Sprinklers etc.

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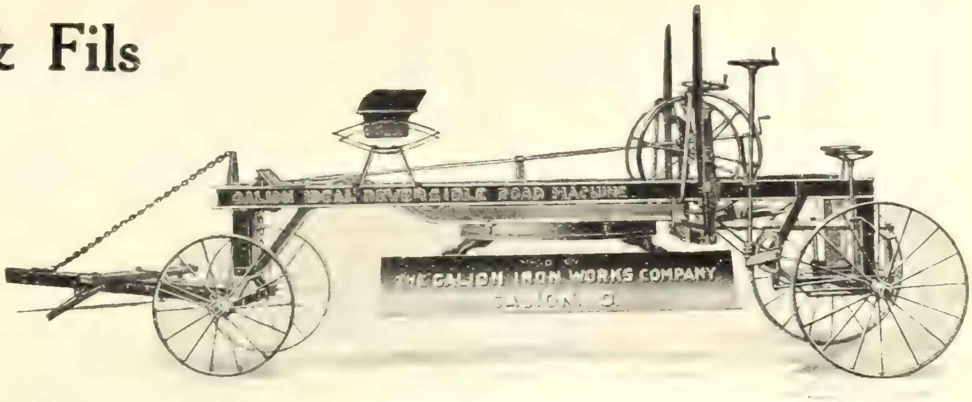
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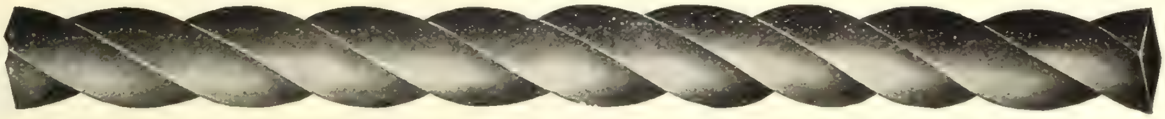

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Twisted Squares
Cross Arm Braces, Plain and Galvanized.

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Angles from ¾ x ¾ in. up to 2 x 2 ins.
Round and square from ⅜ in. up to 1¼ ins.
Flats from ¾ in. up to 4 ins. in width, and other special sections.

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Easily installed and securely connected with our Forged Steel Flanges or All Steel Bolted Joints.

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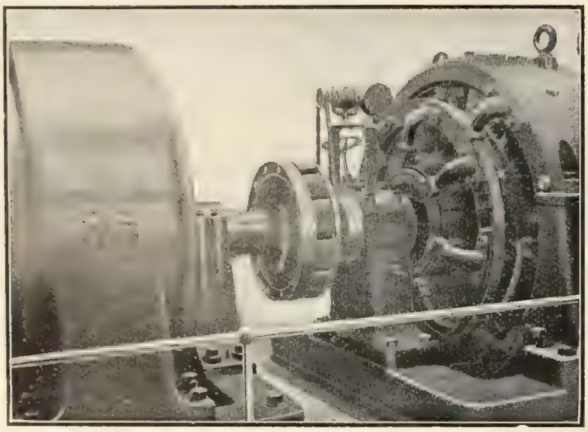

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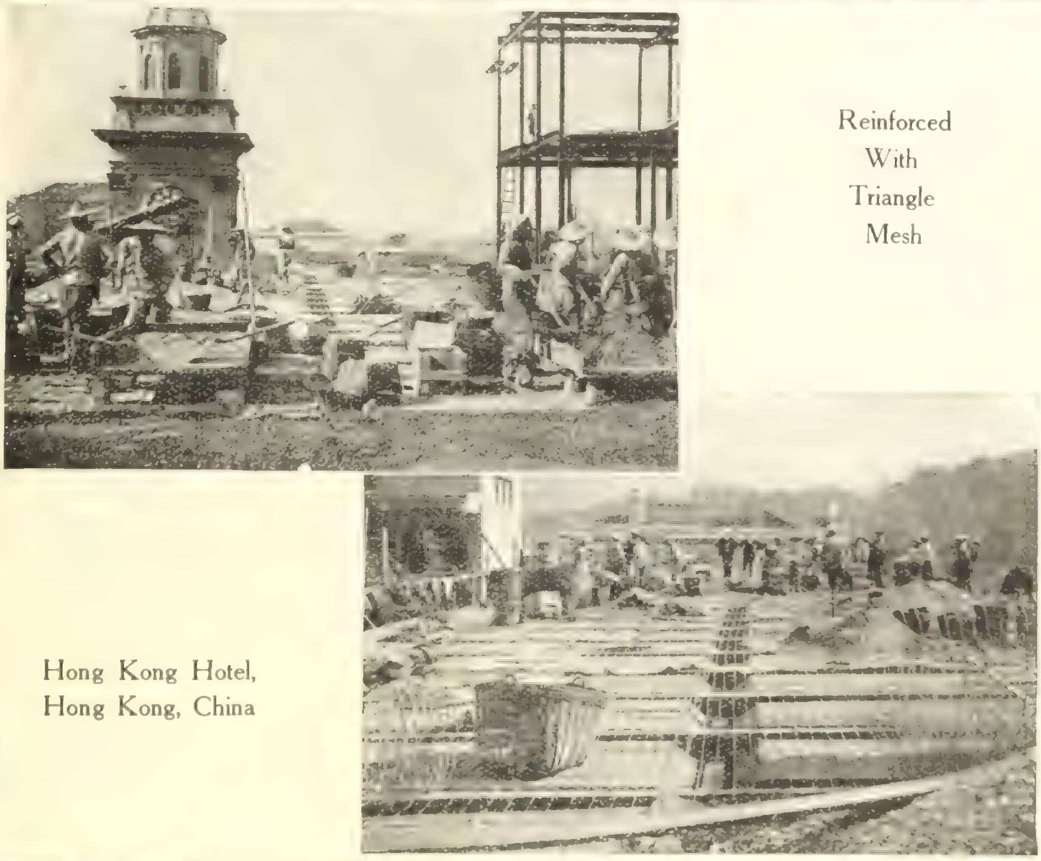
Due to our increased capacity we can ship carload quantities in ten days to two weeks from receipt order and full details at mill.



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For Engineers' Handbook and full details regarding Prices and LOCAL STOCK ON HAND, address any of above offices

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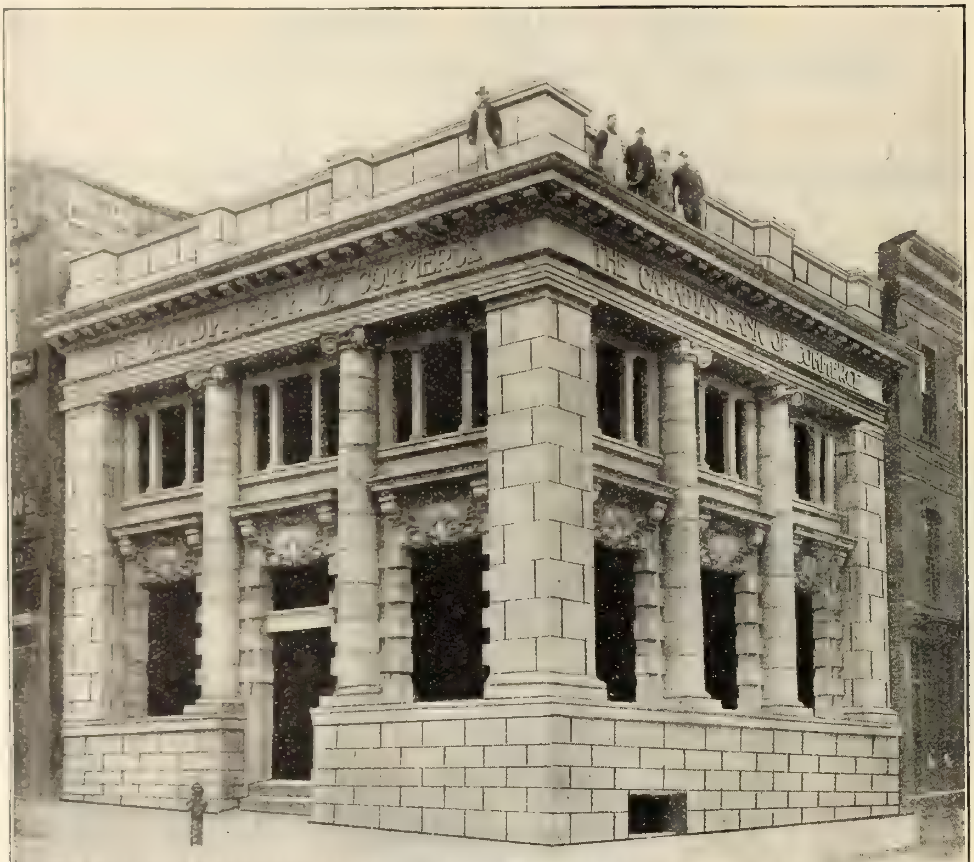

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Roman Stone is of uniform texture and hardens with age—it is the same quality all the way through—no veneer.

Roman Stone permits of artistic designs the cost of which would be prohibitive in Natural Stone.

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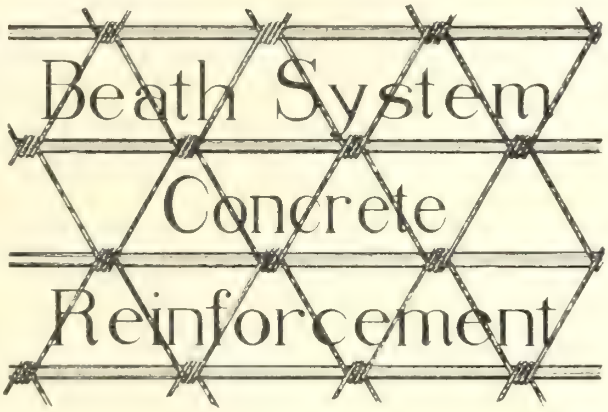
Made of cold drawn mild steel wire, guaranteed tensile strength 90,000 lbs., elastic limit 50,000 lbs. per square inch.

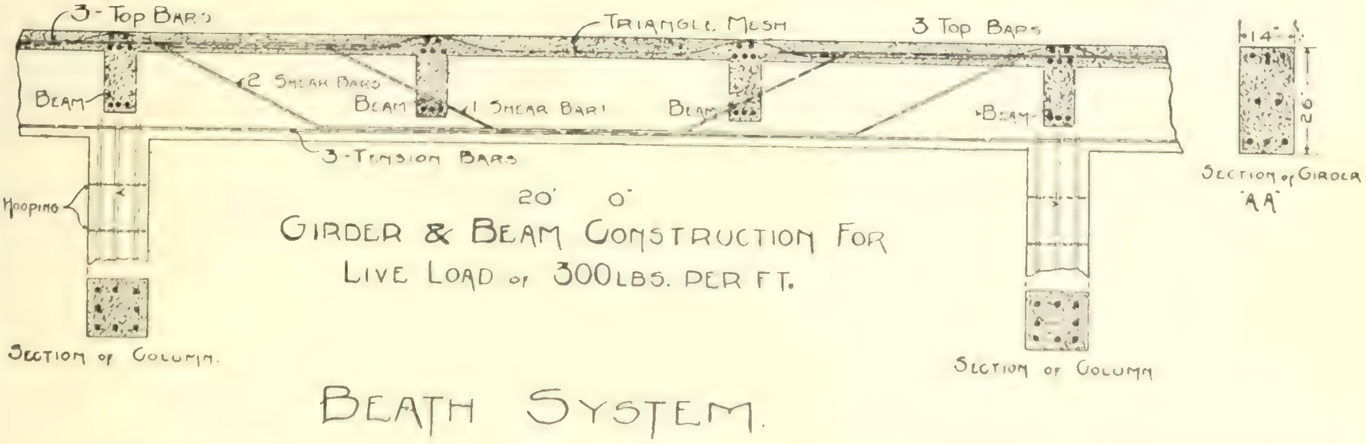
Supplied regularly in rolls 150 ft., 500 ft. and 600 ft. in length, allowing continuous reinforcement over supports. Cut to general length if required.



Main stresses carried on heavy longitudinal or tension members. Diagonal cross wires provided to assist in longitudinal reinforcing and at the same time distribute stresses to main tension members and take care of temperature stresses and strains.

- Provides more even distribution of steel reinforcing in every direction.
- Tension or carrying members accurately spaced.
- Most perfect mechanical bond.
- No tying or lapping necessary.
- Minimum cost of laying.
- Easily handled and stored on the work.
- Low cost of inspection.
- Absolutely continuous action from end to end in structure.
- Higher elastic limits with the same quality of steel due to cold drawing.
- Every ounce of steel tested, as it cannot be cold drawn without showing defects, if any.
- Diagonal cross wires distribute stresses due to concentrated load over a greater area.
- The only design of fabric reinforcement where cross of diagonal wires assists longitudinal or tension members in carrying the load.
- Supplied black or galvanized, but black is recommended owing to its better bond in concrete.

BEAM AND GIRDER BARS



The Beath System Concrete Reinforcement is applicable to any form of concrete construction and offers advantages that cannot be obtained elsewhere. We can show you how to build a fireproof building at the lowest cost possible.

W. D. Beath & Son, Limited

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The

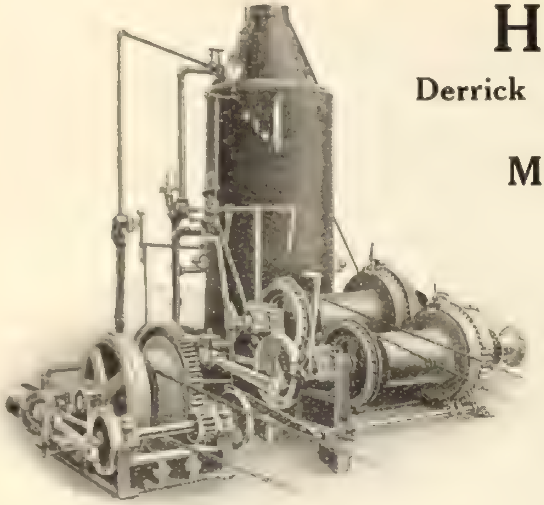
Doty Marine Engine and Boiler Co., Ltd.

Manufacturers of SUPERIOR

HOISTING ENGINES

Derrick Swingers, Material Elevators, Safety Mine Cages, Etc.

MARINE ENGINES BOILERS



This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.

Doty Engine Works Co. of Winnipeg, Ltd.
Foot of Water Street, WINNIPEG, Man.

The Thew Shovel for Road Construction

The general use of the Thew Shovel in road building and street grading is conclusive proof that it is adapted to the conditions, economical for the purpose and efficient in operation. The following list of some of the contractors, in the State of New York alone, who have used and are using The Thew No. O Full Circle Swing Shovel in this class of excavation will indicate the popularity of the machine and its undisputed merit on such work :

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H. B. Sproul, Peekskill, N.Y.
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James E. Martin, Ploughkeepsie, N.Y.
F. G. Fowler Const. Co., Mt. Kisco, N.Y.
Brown & Lowe, Schenectady, N.Y.
Buckley Const. Co., Plattsburg, N.Y.
Newport Const. Co., Newport, N.Y.
Monroe Roads Co., Pittsford, N.Y.
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Shanley-Morrissey, Inc. New York, N.Y.
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The Thew Shovel is popular because it can do the work.

There is no other shovel of equal weight and dipper capacity that can handle as difficult material, nor under equal conditions, as large an output as the No. O Thew.

Investigate the Thew Horizontal Crowding Motion.

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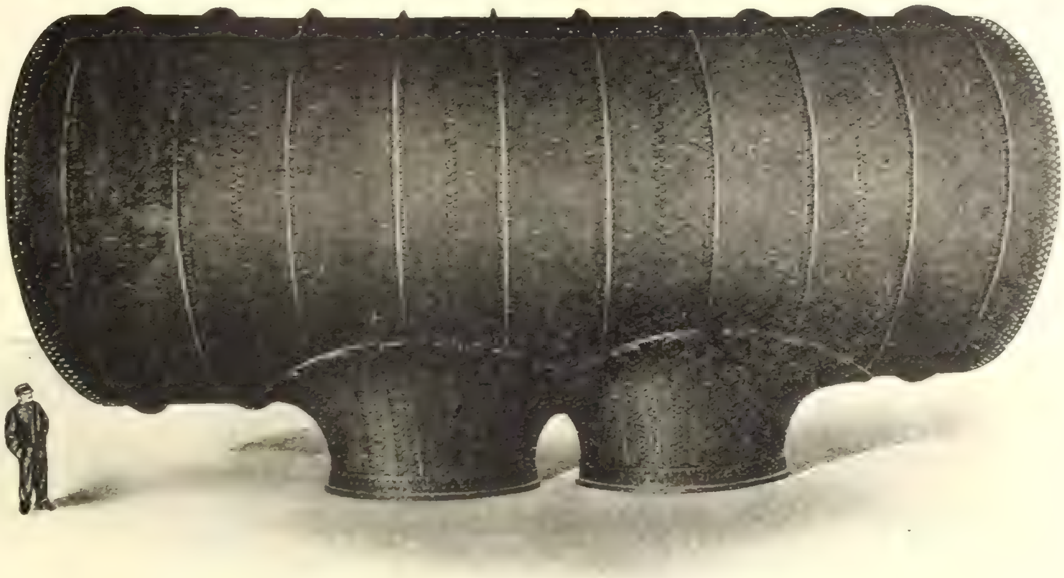

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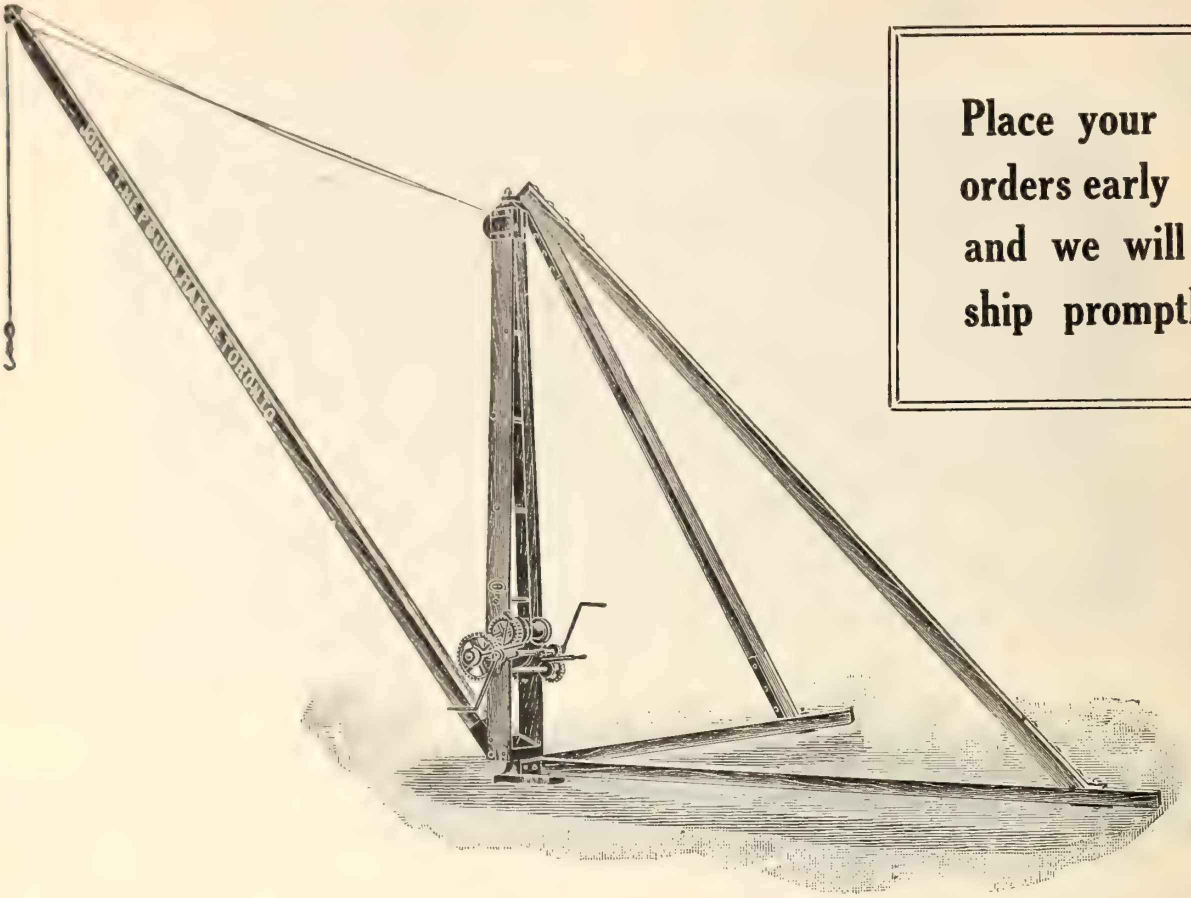
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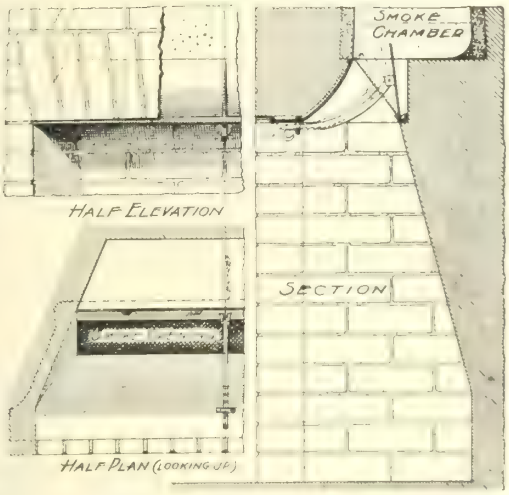

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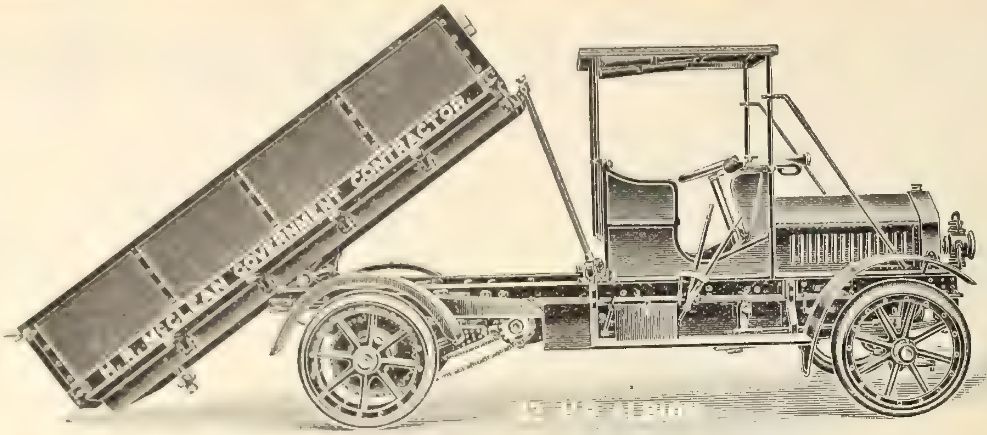
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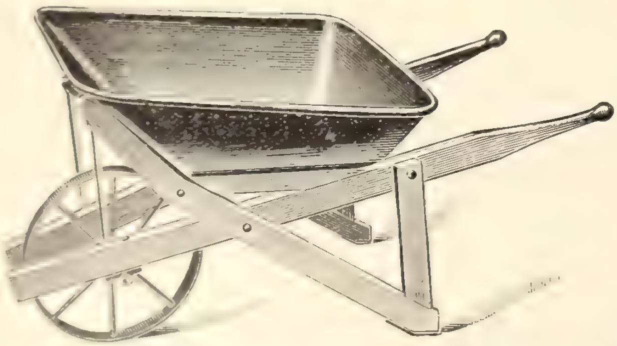

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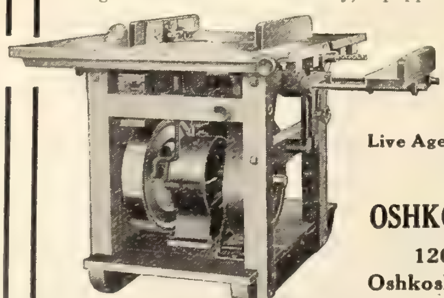

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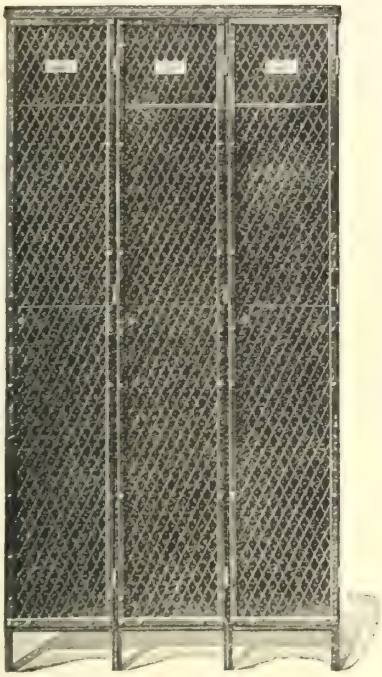

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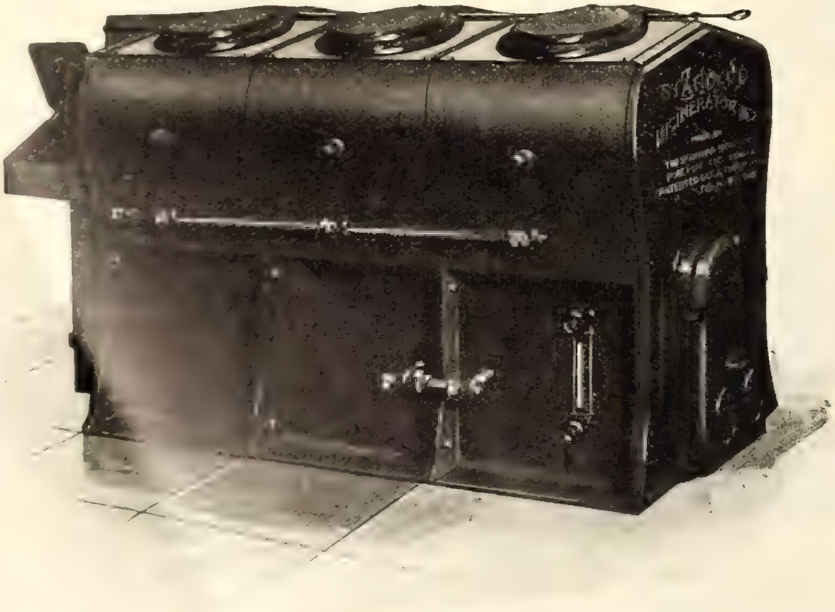

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Vol. 28 April 23, 1913 No. 17

Concerning Graft

THE system of "bribery and corruption" has been spreading its tentacles rapidly within recent years. It is an ever-growing hidden cancer which has been eating its way into every brand of commercial and official life. Witness the dramatic revelation of New York's police force and its elaborate system of graft, as shown in the Becker trial and in the more recent exposure of the corruption of certain United States judges.

Naturally, the engineering professor has not essaped contact with this modern-day evil. Few are the municipal employees who have not been approached, at one time or another, by a contractor bearing some little token of esteem, perhaps in the form of barefaced lucre, or perchance in the more delicate shape of a "gift." But woe betide the unhappy official who yields to such temptation. Sooner or later he will bitterly see his weakness. The contractor who requires to win over the engineer-in-charge by favors is the one who intends to scamp his work whenever possible. And who gets the blame when that is discovered later? —The engineer. To say the least, it is very inexpedient for an official to compromise himself in any way, and so get himself, to a certain extent, under the thumb of the contractor. Sooner or later the pleasant relations consequent on a succession of "gifts" will suffer a jar and then it is a simple matter for the contractor to reveal to a member of the council one or two of the transactions he has had with his former confederate.

It is a safe rule for the engineer to accept no favors whatever from those carrying out work for him or from any person with whom he has dealings in his official capacity. There are always people ready to take notice of these things and to "throw mud" on the slightest provocation. It is especially necessary for the man working under municipal authority to keep himself free from the slightest shadow of suspicion, and it must be his policy to have little to do, outside business hours, with contractors and others with whom he does business. He must not lunch or dine at a contractor's expense, or in any way tend to place the relationship between them on any other footing than that of engineer and contractor. It seems a hard rule to lay down—to debar a man on occasion from social intercourse, but the modern municipal engineer, like the knight of old, must keep himself "sans peur et sans reproche."

The Protection of Lake Water Supplies

THE long distances to which sewage may be carried on or under the surface of a great lake are not generally known, says The Surveyor, of London, Eng., commenting editorially upon a paper by Mr. George C. Whipple, given elsewhere in this issue. It might well be assumed that a water supply intake situated, say, four miles out from the shore, at a depth of 75 feet below the surface, could not possibly be polluted by a relatively small quantity of sewage discharged near the shore. Nevertheless, it has been proved very clearly that the intakes carried far out to the deep waters are at times liable to draw sewage-polluted water, and that the result is a very high typhoid death-rate in the Lake cities.

A paper read before the Engineers' Club of Philadelphia by Mr. George C. Whipple is dealt with more fully elsewhere in these pages, and contains information which should be considered carefully with regard to our own problems of purification by dilution, and outfalls into the sea and tidal estuaries. Mr. Whipple gives the clearest evidence that the currents induced by winds may, and do under certain conditions, pollute the water miles from the shore. That "the sewage is projected through the lake water for several miles with relatively little dilution" is certain. The methods of protection advocated by the author appear to be the purification of the water rather than the attempt to obtain absolutely pure water at the source, or the absolute purification of the sewage. The possibility of failure to render such water pure at all times, even by sterilization, is, however, demonstrated. The sand filter and the mechanical filter, as is well known, are by no means always sufficient; instances of failure through improper working are quoted, and the author in apparently preferring filtration to sterilization is evidently doing so when looking at the two processes as alternatives instead of as supplementary the one to the other. The fact that the typhoid deathrate in Toronto fell after the introduction of a filter cannot surely be held to show the superiority of filtration over sterilization. When one considers the exceptional pollution of the Toronto water, described in our issue of January 24th, almost any result might have been expected. "We had the makings of the largest typhoid epidemic ever known," are the words of Dr. George Nasmith. Mr. Whipple does well, however, to draw serious attention to the dangers which attend the haphazard methods of mixing and applying hypochlorites to water. "That effective sterilization of the water can be obtained by this method is admitted by sanitarians; that it actually is obtained with practice is more doubtful." We have frequently in the past drawn attention to the crude methods in general use for applying hypochlorite to waters.

The general conclusions to be drawn from a study of this paper are that, as far as may be practicable, every safeguard should be employed in order to protect water supplies. These safeguards consist of an intake in the safest place possible, purification of the sewage, and filtration of the water, followed by sterilization. The omission of any one of these increases the possibility of danger, while the inclusion makes it more remote.

The Professional Relations of the Engineer

Discussion by the American Institute of Consulting Engineers

THE professional relations of the consulting engineer, the manufacturer, the contractor and the client, were the subject of an interesting discussion at a recent meeting of the American Institute of Consulting Engineers. Some pertinent observations looking to the adoption of a code of ethics, adequate recognition of the profession and the improvement of the engineer's status were made by Messrs. L. B. Stillwell and Samuel Whinery, of New York City, whose remarks are abstracted below:

MR. LOUIS B. STILLWELL, NEW YORK CITY

The history of those practical men with which the engineer is concerned generally embraces, first, discovery, then invention, then commercial application. As an engineering art grows older, three tendencies which affect the work and relations of the engineer become manifest:

1. In certain large undertakings, such, for example, as railroad building and operation, great corporations are formed, and these soon employ permanent engineering staffs.

2. The art tends toward standardization. What at first was known only to a few becomes more or less common knowledge, and the need of specialists of the higher class is less obvious and less acutely felt, although perhaps not less real.

3. The variety of engineering specialties associated in the construction problems presented by large and complex undertakings compels the co-operation of groups of specialists, and this situation leads to the formation of engineering corporations and partnerships, which, in turn, is frequently the first step toward a combination of the functions of the engineer, the contractor and the financier.

Obviously, each of these three tendencies operates to limit the activities of the consulting engineer and to diminish his numbers, by substituting, as in railroad work, permanently retained engineering staffs; by diminishing his usefulness because of the standardization of engineering practice, and by tempting him, first, to association in order to deal most effectively with complex problems, and then into the fields of contracting and financing in order to insure continuous occupation and increased remuneration for himself and his associates.

The characteristic American disregard of precedent; the equally characteristic American lack of respect for authority and special knowledge and the narrow and short-sighted view of directors and executive officers of some of our great corporations have largely prevented the general adoption in this country of the practice of retaining consulting engineers after the period of active construction has passed and the time of more or less routine operation arrived. Moreover, while the standardization of an art tends to make less obvious the value of the advisory service of the specialist, the increasing difficulty of effecting further improvement and economy as perfection is approached argues on the other hand with increasing weight in favor of supplementing the efforts of the operating staff by the frequent criticism and suggestion of the most competent specialists.

To the three tendencies affecting the work and relations of the consulting engineer frankness demands that we add a fourth, namely, the cumulative effect upon the opinions and practice of executive officers and directors of those mistakes and misunderstandings which are practically inevitable in the progress of complex constructive undertakings carried through to completion, in many cases, by groups of men who perhaps are brought together in close working relations for the first time.

Too many real and serious mistakes are made by the incompetent or reckless engineer. In a much greater number of instances, mistakes and misunderstandings between the banker, the executive and the engineer are responsible for disappointment and sometimes failure. In Mr. Stillwell's opinion there are perhaps no more important objects to be sought by the American Institute of Consulting Engineers than the elimination of the incompetent or reckless engineer and the prevention of those misunderstandings for which the engineer is sometimes in whole or in part responsible, but which more frequently are due to the lack of co-ordination of the activities of the banker, promoter and the engineer for which the engineer is not primarily responsible.

Proper Attitude Toward Manufacturers and Incompetent Engineers

There were two specific phases of the subject which Mr. Stillwell especially hoped to hear discussed:

1. What should be the attitude of the American Institute of Consulting Engineers as regards the competition from manufacturers and contractors which the consulting engineer encounters in the practice of his profession? Is the consulting engineer in what may be called an adult art—a middleman who should be eliminated?

2. The problem of eliminating, or at least restricting, the incompetent or careless engineer who brings discredit upon the profession. In this connection the question should be considered whether any practicable plan can be devised which in apparently flagrant cases would enable the Institute to protect the profession by disinterested and authoritative investigation, which should result either in placing responsibility for a financial wreck, in the case of a great engineering undertaking, directly upon the engineer, or absolving him from such apparent responsibility and placing it where it belongs.

The consulting engineer whose work lies in the electrical field has encountered, in recent years, increasing and very serious competition from manufacturers of mechanical and electrical equipment, who undertake frequently to perform for prospective purchasers of their apparatus important engineering services for which no charge whatever is made.

At the meeting of the Institute on January 16th, 1912, Mr. C. C. Schneider gave an account of a somewhat similar situation which some years ago confronted the consulting engineer whose specialty was the design of bridges, and he told how practice in this department of engineering effort had been improved. Upon the same occasion Mr. Stillwell called attention to the competition to which electrical and mechanical engineers are subjected by the existing unfair and, in his opinion, improper practice of companies manufacturing electrical and mechanical equipment. At that time he made the following suggestions:

1. The American Institute of Consulting Engineers, the American Institute of Electrical Engineers, and our other national engineering societies whose members undertake work of this character should adopt a schedule of minimum charges so far as the service rendered can be classified.
2. The companies manufacturing electrical apparatus in furnishing estimates, plans and specifications relating to aggregations of apparatus constituting plant or equipment should regard themselves as consulting engineers, and invariably should exact for the service rendered at least the minimum charge recommended for its membership by the engineering societies.
3. Consulting engineers who secure from manufacturing companies such estimates, plans and specifications should pay the manufacturing companies for them just as any unprofessional inquirer would pay under the plan suggested.

Participation in Public Affairs

Mr. Stillwell, in closing the discussion, said that engineers are largely responsible for the situation of which they complain, by reason of the fact that they have had a false notion of what constitutes professional propriety. The idea of most engineers is that of sitting back on the fence when there is a problem of importance affecting the public and letting the problem be argued out by newspaper men and politicians. When there is a great waterway proposition under discussion at Washington and the society is notified to send representatives there to advise them, they should be sent down without expense to make their views known. They need not enter into the political discussion, but they should give them the facts. The American Institute of Electrical Engineers did that last year; it sent a committee to Washington to appear before the National Waterways Commission and that committee was welcomed with open arms and kept there two days under examination before any of the fellows who had an axe to grind were invited to speak, and some who stayed there found themselves in the position of expert advisers to the committee. Inside of six weeks the chairman of the commission came to Mr. Stillwell and said, "Here is a difficult point, and we would like to have your committee of engineers study this thing and tell us what they think of it." This is what the Institute wanted to establish.

The arts advance so rapidly that engineers have somewhat lost their breath, and the more or less pessimistic view taken is due to the fact that the procession is moving by us. In the early days of a new art the interpreter is particularly needed; as the art grows older he becomes apparently less essential and he may be superseded by the contractor. There is nothing unethical in that. The only wrong is in pretending to be one thing when he is another.

In time the thousands of men who are being educated as engineers in this country will take charge of work, not only as engineers, but as managers, presidents and directors. There is no reason why engineers cannot graduate into these positions, and, with their knowledge of when it is necessary, call in the architect and engineer. Instead of waiting for someone to call engineers, they will be the people to do the calling.

MR. SAMUEL WHINERY, NEW YORK CITY

Engineering is commonly spoken of as a profession. Possibly the strongest claim that can be truthfully made is that it is a quasi-profession, since it has no legal existence. But even if we disagree as to this point, the careful observer of present tendencies in engineering, industrial and commercial matters cannot fail to be impressed with the feeling that engineering as a profession, is passing through a critical and dangerous period. The status of the engineer in the future will depend largely upon whether engineering shall develop into a well-defined profession or into a mere trade or vocation.

The meaning of the word "profession" is not as clearly and sharply defined as we could wish. Some of the characteristics of a profession are, however, well understood. One of these is that a profession is a vocation founded upon specialized educational training, the purpose of which is to supply disinterested counsel and service to others for a direct and definite compensation, wholly apart from expectation of other business gains. To put it more briefly, the professional function necessarily assumes the absolute divorcement of engineering from commercialism in all matters involving the engineer's relation to his clients and to the public.

It is the violation of this principle which now threatens the destruction of the profession. There is to-day a strong tendency to combine the professional and the commercial aspects of engineering. The large and the notable successes of so-called "engineering firms" and "corporations" that undertake important public enterprises from their inception to their operation, through all the stages of exploitation, design, financing, construction and operation, offer the most convincing evidence of the drift of the times toward the commercialism of engineering. The large number of able engineers whose main vocation is contracting, but who, at the same time, assume to maintain a professional practice and standing, is another very significant sign of the times. If, upon the whole, it shall develop that by such a combination of engineering and commercialism projects can be carried through more cheaply, conveniently and satisfactorily than by the separate employment of independent engineers, there can be no doubt of the final outcome. Engineering as a profession will cease to exist, and engineering knowledge, skill and ability will become simply one of the valuable commercial assets of business organizations.

If, on the other hand, it shall be developed, and the fact becomes appreciated by the public, that to secure the best results in public or industrial enterprises, the services of the independent, disinterested, professional engineer are essential, there is a possibility that engineering as a profession may not only be maintained, but, in time, placed upon a clearly defined and permanent basis.

Mr. Whinery believes that as a step in the right direction it is necessary, in the first place, that the boundaries and limits of the profession shall be distinctly marked out. There must be some way ot distinguishing between those who belong to it and those who do not. In this respect the profession of Engineering is now anomalous. In Law, Medicine and the Ministry it is required that there shall be some public, formal recognition and record of a man's right to admission as a member of the profession, involving also the power to terminate that right. This is wholly absent in the engineering profession. Any man may hang out his sign as an engineer, and so long as he does not violate the civil or criminal laws neither the state nor the profession can exercise any control over him.

It may be said that membership in reputable engineering societies is a sufficient passport to good standing in the profession, and the reserved right to expel an unworthy member is a sufficient safeguard for the protection of the public. But admission to such a society is not a public notice in the official sense; and it is a rather singular and impressive fact that no man has ever, so far as Mr. Whinery is aware, been expelled from any one of the leading engineering societies for incompetence or unprofessional conduct. Among so large a membership as these societies possess it would be surprising if no one had ever merited such expulsion. The absence of such cases is doubtless due, not to any lack of a disposition to act, but to the fact that no positive, authoritative and comprehensive code of practice and ethics has been formulated upon which a conviction could be based.

If the situation here outlined be even measurably correct, the conclusion seems inevitable that the first and most important thing necessary to establish and maintain a profession of engineering is the public, legal recognition of the existence of such a profession and some measure of official control of its membership by the state.

Following, or in connection with this, there must be a sufficient degree of organization or solidarity within the profession itself to secure coherence and general unity of action. In other words, there must be adequate internal control of the profession. One of the most important functions of this internal control will be to establish comprehensive standards of professional conduct, including the relation of its members to each other, to clients and to the public. Such a "Code of Ethics" may almost be said to be absolutely essential to the successful existence and usefulness of any profession.

It must also be obvious that whatever rules of conduct and practice a profession may consider necessary for the benefit and protection of the public and for its own control and preservation, they must be adopted, promulgated and enforced in such a manner as to attract the attention and command the respect and obedience of its members.

Protection of Water Supplies Derived from the Great Lakes

IN a paper read before the Engineers' Club of Philadelphia, and published in their "Proceedings," Mr. George C. Whipple gives valuable evidence with regard to the effects of sewage pollution upon water supplies derived from the Great Lakes, and discusses the sanitary protection of such supplies.

The dilution afforded by the waters of the lakes to the relatively small amount of sewage entering them, might, at the first glance, be considered sufficient to safeguard the purity of waters drawn at intakes situated perhaps two or three miles out from the shore in comparatively deep water. Mr. Whipple, however, gives exact evidence that contamination does occur owing to various causes, such as currents induced by the wind. From the standpoint of the pollution of water supplies the most important currents are the local currents produced by the wind. For instance, if the wind has been blowing off shore for ten hours at the rate of twenty miles per hour in such a direction as to cause the water to flow from the sewer outfall towards the water supply intake, the surface water will be carried six miles from the shore during the ten-hour period, assuming that the velocity of the surface current induced by the wind is three per cent. of the wind movement. This result would, it is argued, be more than sufficient to carry sewage to the longest intake now in use. Float experiments have shown the possibilities. A group of floats was set adrift in Lake Erie when the wind was blowing at the rate of 13 miles per hour. In one experiment, after the float had travelled 2,500 feet, which was 4.7 per cent. of the wind movement, the floats had spread through an angle of five degrees; in other experiments, with higher wind velocities, the angle of dispersion was less. The angle of dispersion, we are told, varies according to the velocity of the wind, so that after normal days of variable winds the fan of polluted water may spread over a semi-circle.

Effect of Undertow Currents

As a result of undertow currents induced by a strong wind blowing on a lee shore, shore water is carried outward and sewage-contaminated water periodically enters the intake. The evidence as to the undertow currents is best obtained from a study of the temperature of water at different depths, at different distances from the shore, and of the temperature of the water drawn from the intakes. A drop in the temperature follows a sudden change in the direction of the wind from on-shore to off-shore. Thus, at Milwaukee the temperature of the water at pumping was 68 deg. on July 20, 1910, on July 23rd it was 62 deg., and on July 27th 52 deg. Greater falls of temperature of water 40 feet below the surface have been recorded, the drop following a sudden change in the wind from off-shore to on-shore. When the warm surface water is blown away from the shore, cold water flows landward near the bottom.

The undertow currents are of great importance in connection with the dispersion of sewage. During the summer season the temperature of the sewage will be ordinarily not far from that of the surface water of the lakes. If the sewage is discharged at the bottom of a lake at a considerable distance from the shore, it is obvious that when the cold, deep water is flowing shoreward the sewage will be warmer and lighter than the water into which it is discharged. The sewage will therefore tend to rise into the upper strata, and be carried away from the shore by the outward surface current. When the warm shore water is going out at the bottom the sewage will enter water of, approximately, its own temperature, and will have less tendency to rise, and will be carried away from shore by the outward bottom current. Thus, during the summer the movements of the wind, whether towards or away from the shore, tend, at most times, to carry the sewage away from the shore rather than towards it.

Wind Effects

It is also shown where sewage is discharged at a breakwater, that an on-shore wind causes the sewage to be held back at the breakwater, while the lake water, blown towards the shore, turns at the obstruction and flows downward and outward; but on the cessation of the wind, or on its change, the now polluted water held back at the breakwater flows out as a surface current, and gives rise to streaks of polluted water which may extend far out into the lake. From systematic analysis of lake water in the vicinity of large towns the foregoing deductions are shown to be correct. In general, they have shown that the dilution of sewage discharged into the lakes is ordinarily very great. It is, however, very variable, and under certain conditions that occur several times a year "the sewage is projected through the lake water for several miles with relatively little dilution." When the path of this sewage stream lies in a direction from the sewer outfall to the waterworks intake, contamination of the water supply may and does occur.

Thus, observations of the number of bacteria in Lake Michigan water, taken at different distances from the shore opposite the mouth of the Milwaukee River, show that there were 1,268,000 bacteria per c.c. at the mouth of the river, 207,000 per c.c. 1 mile east of the river, 2,000 per c.c. 2 miles east, 970 per c.c. 3 miles east, 225 4 miles east, and 45 per c.c. 5 miles east. The water supply intake is, however, 3.5 miles in a straight line northeast of the river, and here the average number of bacteria was 1,182 per c.c. at the surface and 693 per c.c. at the bottom, the largest numbers being 3,720 at the surface and 1,600 at the bottom, and the smallest numbers being 20 at the surface and 50 at the bottom. Again, taking all of the samples collected at points more than one mile away from the shore, it was found that when the wind was blowing towards the shore the bottom water contained four times as many B. coli as the surface water, but that when the wind was blowing off-shore the surface water contained eight times as many B. coli as the bottom water.

Daily analyses of water at the North Point pumping station, Milwaukee, show variations of from 5,900 bacteria per c.c. to 330 per c.c. within a few hours, while coli are often present in 0.1 c.c., and are occasionally absent from 1 c.c. on the following day. But stronger proof is afforded by the recorded results of the use of the unpurified lake waters upon the public health as measured by vital statistics.

Unfiltered Water and Typhoid

A very complete study of the death rate from typhoid fever and other diarrhoeal diseases in the cities taking water supplies from the Great Lakes is contained in the bulletins of the Hygienic Laboratory of the Public Health and Marine Hospital Service of the United States. These show that the death-rates from typhoid of the lake cities that do not filter their water are very high as compared with European cities that have safe supplies. Figures relating to twenty-two cities are quoted, of these eleven cities had a higher death rate in 1910 than in 1901, three were practically stationary, but showed a high increase during some of the intervening years, while the remainder, showing a drop in the death rate in the year 1910, also showed a considerable rise in the death rate in some of the years between 1901 and 1910. It is shown, moreover, that intestinal diseases, classed as diarrhoea and enteritis, and infantile diseases are exceptionally prevalent in the lake cities that use unfiltered water.

The broad waters of the lakes cannot be used for water supplies because it is impracticable to extend the intake pipes or tunnels to points where the depth of the water much exceeds 75 feet. The longest intake in use is at Cleveland, the end of which is about four miles from the shore, while the shorter intakes do not extend 1,000 feet from the shore. The various attempts made to improve the quality of the water by extending the intakes do not appear to have prevented the contamination of the water; also, many breaks have occurred in the lake intakes which have permitted polluted shore water to enter the pipes, and outbreaks of disease have followed.

Methods of Protection

The rest of the paper is devoted to the consideration of the methods of protecting the lake water supplies. Smaller cities appear to suffer more than the larger cities because their intake and sewer outfalls are closer together.

The abandonment of the lake supply is generally impossible. The extension of the water intake has been shown to be insufficient . The exclusion of sewage from the lake is generally impossible. The complete purification of sewage and storm water involving sterilization is too costly. Ordinary sewage treatment is recommended, but though it will reduce the danger of pollution it will not do away with it altogether. The only safe course is therefore to purify the water itself.

Sterilization by means of hypochlorite is suitable for the lake waters because they contain very little organic matter; but, in the author's opinion, great caution is required in the use of this method. It is of the greatest importance to secure a prompt and intimate mixture of the bleaching powder solution with the water. This is not as easily accomplished as many think, and requires a degree of skill in operation not easily obtained in practice. Failure to apply the chemical properly may easily escape the knowledge of the authorities, and such failure may be calamitous in its results. It is, however, admitted that the effective sterilization of water can be obtained by this method.

It is argued that the method does not completely protect against water-borne diseases, because at Toronto the addition of a filter after sterilization had been in use for some time was followed by a considerable fall in the death-rate, showing that disinfection alone had not furnished complete protection. Owing, therefore, to the uncertainties of operation, the author is of opinion that sterilization should not be looked upon as a means of permanent protection, but rather as a temporary or emergency measure. He considers that the best method of protecting lake water is filtration, and makes a comparison of the two processes worked separately to the advantage of filtration. Further, he is of opinion that, although sand filters are more costly to construct, the cost of their operation is less; while, on the whole, the results are more trustworthy than is the case with the mechanical filter. Cases are quoted of the improper working of sand filters, and of mechanical filters causing outbreaks of typhoid at Ashland, Wisconsin, and at Lorain, Ohio, respectively. Apparently the use of sterilization as an additional safeguard is approved.

Finally, the author considers that where the water supply is filtered, expensive treatment of the sewage discharged into the lake is unnecessary, although it affords an additional factor of safety.

Mr. S. P. Brown, of Montreal, on Tunnelling

Mr. S. P. Brown, the chief engineer of the Mount Royal tunnel of the C. N. R., addressed the members of the Canadian Club, Montreal, on "Tunnelling." The address was almost free from technicalities, relating largely to the conditions under which the work is done.

"The method of excavation," he said, "employed in the tunnel is a bottom centre heading, with break-ups at intervals, where the full-sized tunnel section is developed. The heading is the 'opening wedge' of the tunnel; it is the thoroughfare through which everything must pass. The excavation of it is much more expensive than the rest of the tunnel, but the break-ups are very cheap and rapid to excavate. Jumbo timbers are framed into the heading at the break-ups, and on to them the excavated rock falls, so that the traffic in the heading is never interfered with. The first operation in tunnelling is always to drill the rock in wedge-shaped blocks, and lift these out by blasting."

Referring to the geology of Mount Royal, the speaker said that it was a volcanic intrusion of igneous rock forced up through a bed of Trenton limestone, and there had evidently been several stages of eruption. The two principal rocks encountered were Trenton limestone, which was found on the sides, and was hard and crystalline, and good for tunnelling, and Essexite, which was very hard and somewhat difficult to drill, but otherwise good for tunnelling.

The line adopted for the tunnel was the shortest possible route between the two objective points—the Model City and the business centre of Montreal—that could be devised to avoid obstructions. "It is believed," he continued, "that while much of the Breccia and some of the limestone which is found in the centre of the mountain will require masonry lining, part of the limestone will only require a central wall for support, and for the Essexite no centre wall will be required except for ventilation and safety." This gives a good tunnel line, which, with the exception of one curve under the McGill College grounds, is all on a tangent, and at only sufficient grade to ensure proper drainage.

"A good example of the effect of the character of ground on tunnel progress was illustrated in the Mount Royal tunnel heading going east from the west portal. In the limestone, which was a very free drilling rock, for the first 1,500 feet the rate of progress steadily increased, as the men worked into the methods of excavation adopted, until they were making an average of over twenty-two feet per day. When this volcanic Breccia was encountered the progress instantly dropped to nine to twelve feet per day, nor could it be materially improved until the character of the ground had changed. In the crystalline limestone the average progress, without drill carriages, is about eighteen feet per day."

The tunnel itself will be excavated as one large tunnel about 33 feet wide by 22 feet high, and divided into two separate tubes by a concrete centre wall for safety, ventilation and economy.

Suggestions for Laying Wood-Block Pavement

By H. L. Collier

Be careful in making the Portland cement base. Proportion depth to traffic, and always finish the concrete base with a template and straight-edge. A mortar bed of 1 part cement and 3 parts screened sand, mixed dry, struck off with a template and dampened with a band-sprinkler just in advance of the paver is to be preferred for the cushion. Lay the blocks close-jointed sidewise and with ⅛-in. joints between the ends of the blocks. Provide a 1-inch expansion joint at the curb for a 30-ft. street and a 1½-in. joint for a 50-ft. street. Have no transverse expansion joints in the pavements.

After the blocks have been spaced, inspected and low blocks brought up to grade, the surface should be swept clean and a bituminous filler, which does not melt below 175 deg. Fahr., or become brittle above 15 deg. Fahr., should be poured on the surface and worked back and forth with a squeegee until all joints are three-quarters full. Then apply a layer of pebbly sand. Traffic should be excluded for at least four days.

If a sand cushion is used, let it be only one-half inch in depth, made of screened sand not too fine.

Instead of a mortar bed or sand cushion, a splendid plan is to paint the concrete base with a coating of paving pitch or asphalt cement, with 10 per cent. by weight of Portland cement stirred in. The pitch or asphalt is heated up to 300 deg. Fahr. and applied promptly. This plan should be used universally on bridge floors.

Blocks should not be loosely laid on a sand cushion, varying from ½ to 2 inches in depth, and a sand filter used. As the blocks shrink the sand trickles down to fill the space made and keeps the blocks hugged in this narrowest limit. When the blocks are wet so also is the sand, and when the blocks expand to their natural sizes, the wet sand will not yield and a buckle of the block occurs. If sand is to be used as a filler, lay the blocks close-jointed, both longitudinally and transversely, and place a ½-in. layer of coarse, pebbly sand on the surface.

There is no good accomplished in calling for 66 per cent. or 95 per cent. of heart timber. Such a requirement adds considerably to the cost. Mill men are anxious to sell heart lumber, but they greatly increase the price charged therefor. Square-edged and sound Virginia southern yellow pine, free from all defects which would injuriously affect th etimber for the uses intended, is all that is needed in an up-to-date, first-class timber specification for paving blocks.

There is an honor in business that is the fine gold of it; that reckons with every man justly; that loves light; that regards kindness and fairness more highly than goods or prices or profits. It becomes a man more than his furnishings or his house. It speaks for him in the heart of every one. His friendships are serene and secure. His strength is like a young tree by a river.

We all have the same twenty-four hours to work with; and the man who piles up the biggest balance of achievement, or money and success, is the man who knows best how to work with this period, and how to get the most out of it. Time economizing is more important than money economizing, for the right use of time is the price of every earthly accomplishment and reward.

Evolution of Fireproof Grain Elevators with Circular Tile Storage Bins

The Canadian Northern Elevator at Fort William, Ont.

By Peter B. Wright

As long ago as 1865 the methods of handling and storing grain in large quantities had been brought very nearly to mechanical perfection, but at that time little or nothing had been thought of fire prevention. The elevators had been built with solid walls of wood, sometimes covered with sheet iron and in rare instances surrounded by brick walls. A standard wall, six inches thick, made of 2 x 6-inch scantlings, nailed one upon the other, and breaking joints at the intersections, was adopted. It is even used now in the cheaper small elevators located at railway stations for receiving grain from the farmers and loading the cars.

Instead of fireproofing, the sole reliance against loss by fire was placed upon policies of insurance. The rates for this kind of elevators have always been excessive, varying from 2½ to 3½ per cent., due to the fact that an elevator fire is almost always a total loss; for the grain, if not burned, is destroyed by water, and rarely, if ever, can such an elevator be repaired after a fire. These risks vary also according to the external exposure of such structures, and they have always been placed in isolated locations as far as possible. When, as now, banks are willing to advance money on grain certificates representing grain stored in scientifically constructed fireproof bins, without the additional security of policies of insurance, it will readily be appreciated what a great success has been achieved in the structures to be described in this article.

The first fireproof elevator was erected at Buffalo, in 1869, after plans made by Geo. H. Johnson, engineer, who was the father of Ernest V. Johnson, now Vice-President and Western Manager of the National Fire Proofing Company. This was called the Plympton elevator, and was the only one of the kind ever built. The bins were circular, with ten-inch walls, built of two courses of common bricks, with a two-inch air space between. They were banded at intervals of eighteen courses, with cast iron perforated plates in short sections, which served to preserve the two-inch space between the two courses of bricks, and were tied, one to another, with vertical rods in the air spaces. There was no enclosing wall. The interstices between the bins were also used for storage. This elevator was taken down several years ago to make room for improvements by the New York Central Railroad. It was always a paying investment, largely on account of the saving of insurance.

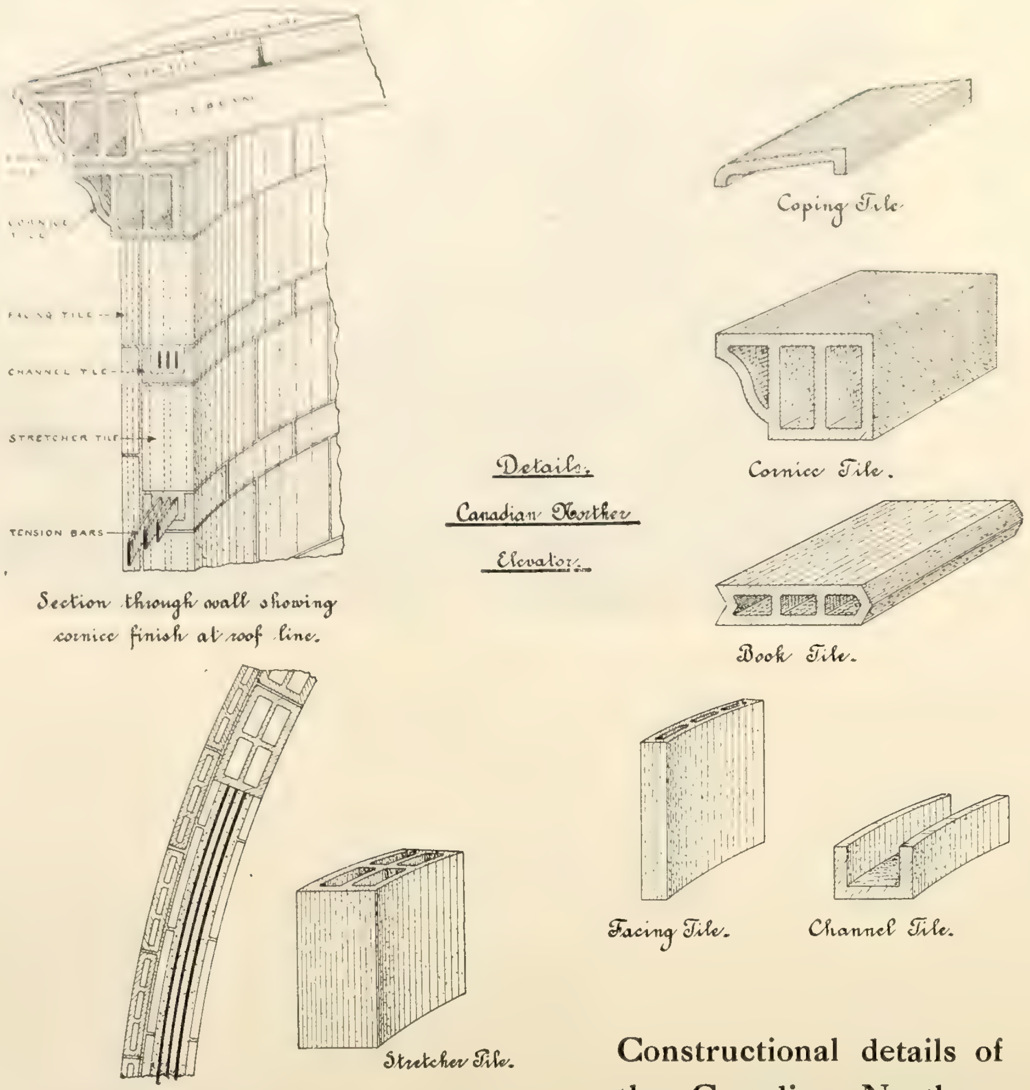
The first use of hollow tile in elevator construction was for the protection of the "cupola" from external fire. This was done at Chicago in 1872. The wooden bins, which were rectangular in plan, were then first enclosed by brick walls. This was thought to be sufficient for external protection, but was very expensive, because it called for double external walls for the bins.

In 1890, elevator A of the New York Central and Hudson River Railroad Company, at Sixtieth street on the banks of the Hudson River, in the city of New York, was built in the following way: The first story enclosing wall is brick and the bins and cupola, which are of wood, are covered with salt-glazed hollow tile. Several others of the same construction were afterward built.

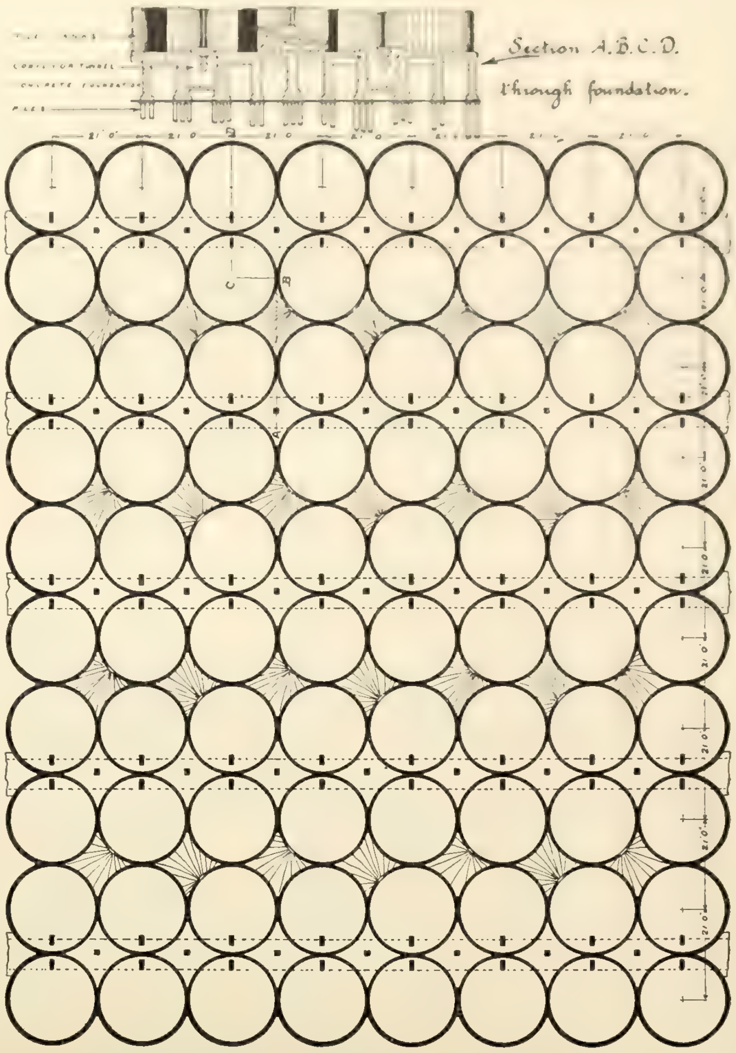
Experimental Work With Tile Construction

The success of the Plympton elevator induced the designer to experiment in the construction of circular bins of hollow tile, instead of brick. In this he was assisted by James L. Record, an elevator architect of Minneapolis. In 1899 they built a grain tank at their own expense as an experiment, on the grounds of the Osborne-McMillan Elevator Company, at Minneapolis. It was twenty feet in diameter and sixty feet high, with a capacity of 30,000 bushels. It was erected during one of the coldest of Minneapolis' winters, and was filled with grain thirty days after completion. The test was successful and it has been in use ever since. It was also tested for pressure and fire-resisting qualities, and an intense fire built around it had no effect upon the grain within. In less than a year after this they built four supplementary tanks for the Great Eastern Elevator Company of Minneapolis. They were erected by the Barnett & Record Company, of Minneapolis.

Showing how tiles are laid in building grain tanks for the Canadian Northern Railway at Fort William, Ont.



Details of construction



Ground plan, showing eighty round tile tanks

Constructional details of the Canadian Northern Elevator at Fort William.

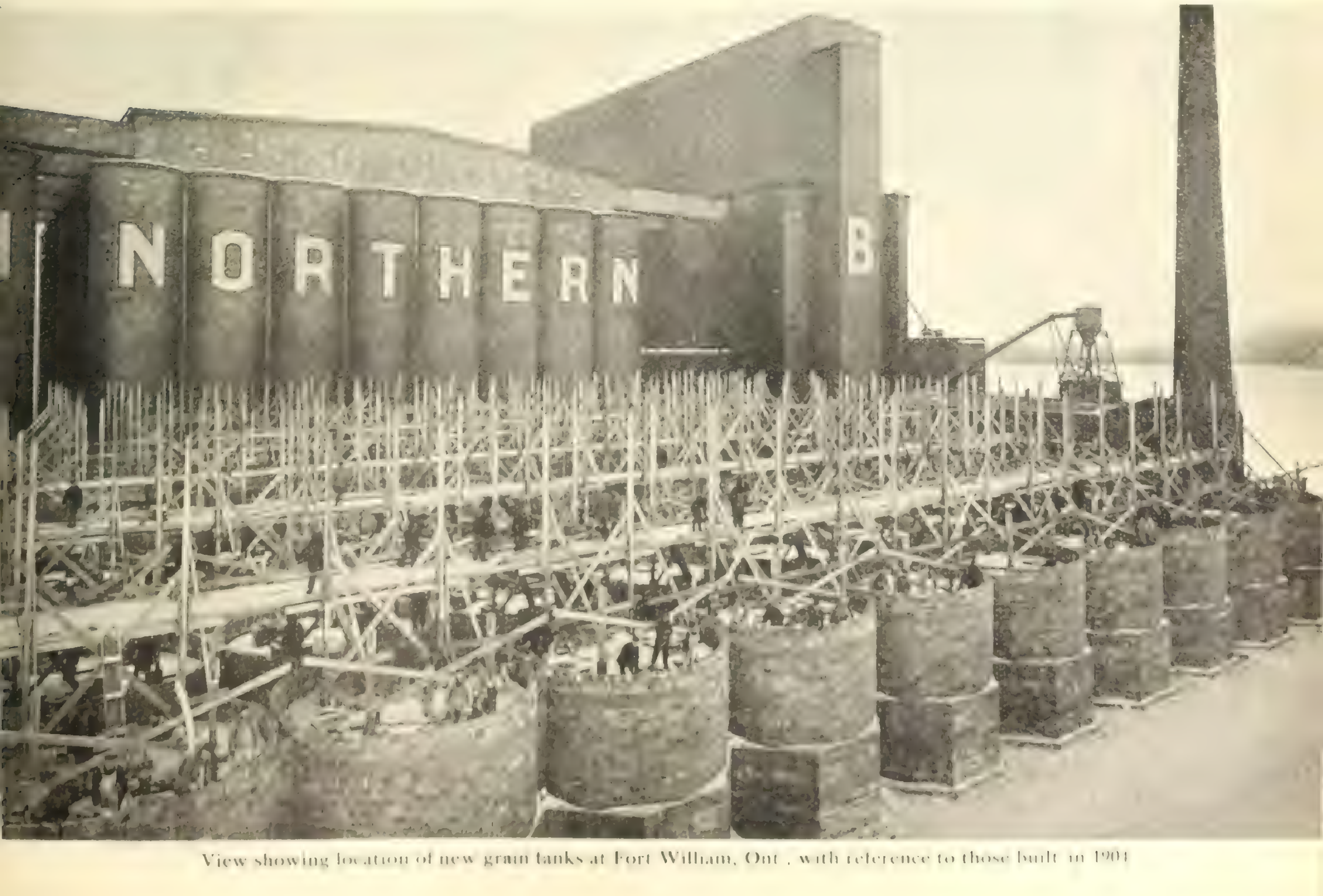
It may interest the reader to know something of the details of construction used in these first hollow tile grain tanks erected for commercial purposes. Unlike the brick tanks of the Plympton Elevator, they stand isolated one from another, and each is 46 feet in internal diameter and 85 feet high, with a capacity of 100,000 bushels, the weight of grain in each tank being 2,800 tons. They were built with a single wall of 6-inch hollow tiles, lined with 2-inch split furring tiles on the inside. Courses of 6 x 8-inch hollow tiles set on end, each having four hollow spaces, were alternated with courses of 4 x 6-inch tiles, made in the form of a continuous trough and laid on their backs. Flat steel tension bars continuing around the tanks in three courses, and breaking joints, but not riveted, were set in the troughs on edge. The troughs were then filled with cement grout and a bed thus formed for setting the next course of hollow tiles on end. The two-inch lining tiles were then set. The tanks were built on cut stone water tables and covered at the top with T-irons and "book tiles."

After the erection of this plant Mr. E. V. Johnson adopted a form of construction for all tanks with two-inch salt-glazed furring tiles on the outside. They are secured as fast as the wall is built with galvanized steel anchors. [See illustration of details of construction.]

The first hollow-tile tanks built in nests with intersecting walls were built in 1900 by the Barnett & Record Company. The spaces between them formed intermediate tanks, such as are herein illustrated as erected for the Canadian Northern Railroad at Fort William, Ontario, Canada. These were for the North Star Milling Company, at Minneapolis. To enumerate all the elevators equipped with hollow-tile grain-storage tanks erected by that company and its successor since that time would fill a page of this journal. The materials of all of these have been manufactured at the works of the National Fire Proofing Company at Ottawa, Ill. But none of them equal for size and capacity those erected for the Canadian Northern Railroad at Fort William.

The Canadian Northern Railway operates the largest grain storage plant in the world; the capacity at present is 7,500,000 bushels. In 1902 they adopted the Johnson-Record fireproof hollow tile system of erecting grain bins and have used it ever since. The first plant at Fort William consists of 80 cylindrical tanks, 31 feet in diameter and 100 feet high, with 63 intermediate spaces also used for the storage of grain. This cluster of tanks and intermediate spaces had a storage capacity of 2,500,000 bushels. All of the work was erected during the months of December and January, and at none of this time was the thermometer above zero. Shortly after completion the tanks were filled with grain which was not shipped out until the following August. No settlement or deflection developed, nor has there been up to this date any evidence of defect in construction.

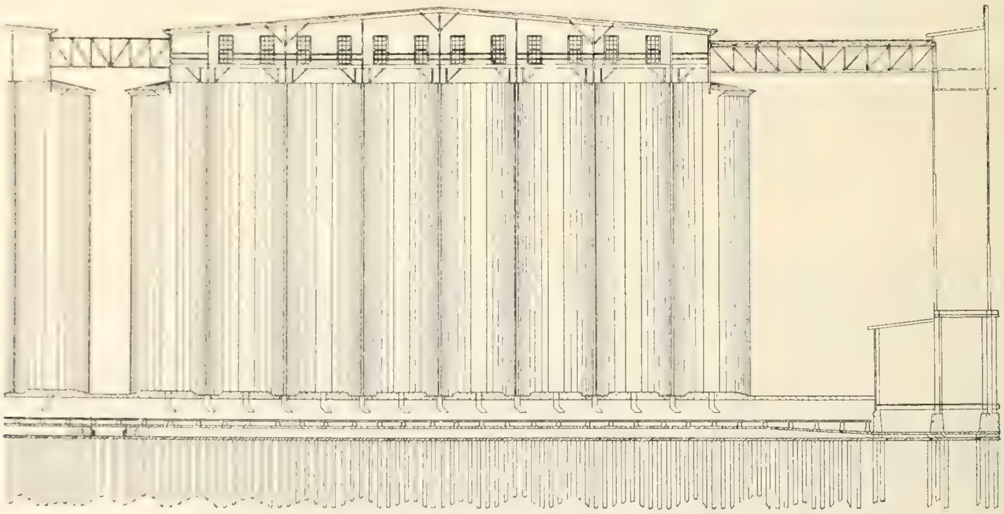
In 1904 increased capacity was required and the company had the original plant of 1902 duplicated, adding 2,500,000 bushels capacity to its plant. These storage houses are connected to each other and to the working house by steel truss bridges covered with corrugated iron and provided with tile and concrete



View showing location of new grain tanks at Fort William, Ont., with reference to those built in 1904 bins. They consist of 80 circular tanks and 63 intermediate bins as mentioned in the last paragraph. A one-storey steel frame work above these tanks and bins, covered with hollow tile, caps the structure and forms the room for the conveyors and spouting used in filling this mammoth storage building. Five conveyors in as many tunnels in the concrete foundation below the bins take the grain to the working house for cleaning or shipping.

Again, in 1912, it became necessary to add additional storage to this mammoth plant and the Johnson-Record system of fireproof hollow tile was adopted for this purpose. The illustrations show 80 additional grain bins being erected immediately adjoining the old plant.

The Barnett-McQueen Company is erecting this addition, as shown by the illustration. All of the hollow tile was manufactured at the works of the National Fre-proofing Company at Ottawa, Illinois, and shipped by water from Chicago direct to Fort William. Some conception of the magnitude of this great enterprise may be gathered from the illustrations. The fact that the work was carried on continuously during the winter, and that no defects have yet been discovered, speaks volumes for this method of construction. The workmen may be seen well bundled up, and indifferent to the cold, while the snow on the ground attests the nature of the weather. One of the illustrations shows them at work on an interior scaffolding, which is raised by machinery upward as they progress.



Longitudinal section of tanks through conveyors

Four braced reinforced concrete towers are a feature of the Oakwood River bridge, recently built to connect a residence section of Chartiers township with the borough of Crafton, Pa. The bridge is 300 ft. long between abutments and the supporting bents are spaced 30 ft. on centers. Each bent consists of two posts, 30 in. square, with a batter of 2 in. to 1 ft. The longitudinal and transverse struts connecting these posts at the bottom and center points, thus forming the towers, are 18 x 30 in. The knee-braces which are placed at the junction of posts and struts are reinforced with short 1¼ in. rods extending into posts, struts and girders. The 10 in. roadway slab is supported on two longitudinal girders 2 ft. 6 in. wide and 5 ft. 9 in. deep, spaced 20 ft. on centers, supplemented by floor-beams 18 in. wide and 45 in. deep, which are spaced 7 ft. 6 in. on centers. The sidewalks are carried on 12-in. brackets, cantilevered out 5 ft. from the outside face of the girders. The floor system thus provides two 5-ft. sidewalks and a 24-ft. roadway. All bents were carried to rock foundation and the saving of this type of construction over the estimated cost of a concrete arch amounted to about 58 per cent.

Reinforced Concrete Tower at The Hague

A Gothic tower of reinforced concrete, forming part of the Palace of Peace at The Hague, is 140 feet high and consists of three lifts. The base is 29 feet square, outside dimensions, and 25.5 feet square inside. The second lift also is square, 21.5 feet on a side. The base of the third lift, forming the spire, is circular, 13.5 ft. in diameter. These parts, according to Mr. J. J. L. Bourdez, in the "Ingenieure," do not rest directly one on the other. In old Gothic towers the second and third stages are supported by means of iron bonding. In this instance, the first stage is supported by a reinforced concrete slab, 4 ft. thick and weighing 180 tons. The timber work was supported by lattice girders resting on a projecting ridge of the brickwork base, the material being brought to the top of the tower by a small electric hoist. When the 13 tons of reinforcement had been placed in position, the floor was filled in to a thickness of 1 ft. The floor showed a deflection of 2 in.; after a week the supporting work was removed, and when the concrete had set the filling was completed up to 4 ft. thickness. The circular spire is similarly supported on a slab 2 ft. thick. A square hole had to be left in each slab to allow for the passage of the stairway.

An unusual and ingenious method was devised to extinguish a burning gas well at Lone Pine, Pa. The well in question, which has a capacity of 5,000,000 cu. ft. per day, was ignited by a flash of lightning. After three days of ineffectual attempts to extinguish the gas, a boiler stack, with base, was mounted on rollers and moved over the 8-in. casing of the well. A sudden jerking away of the stack, out of the top of which the flame was raging, made a break in the current of gas, thus extinguishing the fire instantly.

The world generally gives its admiration not to the man who does what nobody else attempts to do, but to the man who does what multitudes do well.

Methods of Sludge Disposal in England

An Excellent Field for Research—Advanced Experimental Work—Various Processes Described in Conjunction with a Discussion of Noteworthy Practice

THE sludge problem, in spite of the great advance in sewage disposal made during the past few years, has not yet been satisfactorily settled, and the satisfactory disposal of this residue from every process of sewage treatment still offers opportunity for great developments. All large cities which dispose of their sewage otherwise than by dilution are facing the problem. One of the large plants in this country often referred to as a model of most advanced practice discharges all of its sludge and sediment into the river, generally during the high water; but few large cities are so located as to make this possible. Providence, R. I., which for years had been using filter presses for concentrating the sludge from chemical precipitation and depositing the sludge cakes on low land in the vicinity of the works, began about two years ago to carry the sludge in boats to deep water in the sound or lower bay. London maintains a fleet of ships for the sole purpose of carrying to sea the sludge from its sewage.

There are unquestionably valuable materials in sewage sludge, but there may also be and usually are other substances which tend in many cases to neutralize this value or are even deleterious. The utilizing of the sludge for fertilizing has always been and is still considered as offering the most favorable field, but recently the recovery of ammonia, grease and even combustible gases has been attempted by more or less complicated processes. So far as we know there is not a single instance in this country of any of these processes being used on an operating scale.

In England the difficulty of disposing of sewage is even greater than in this country, since there are few streams in that country of a sufficient size to entitle them to the name of rivers in the United States, at least in the eastern part. Consequently, in England the research and experiments made in the utilizing of sludge are more advanced than those of the United States.

Watson and Butterfield Process

One of the processes advocated there is that known as the Watson & Butterfield, which, although it was described in the fifth report of the Commission on the Treatment and Disposal of Sewage, has not yet been introduced by any city, we believe, although it is possible that a large plant will be erected near the city of London. In this process the sludge from precipitation tanks, containing about 90 per cent. water, is reduced to 50 or 60 per cent. water by filter pressing; after which it is dried until it contains only 20 to 25 per cent. water. The drying is accomplished either by spreading it on the ground under open sheds, or by passing it through mechanically-driven rotary cylindrical dryers heated by burning the gases obtained from the sludge itself by distillation. The cost of filter pressing is said to average from 55 to 61 cents per ton of cake which contains 50 to 60 per cent. water. The cost of drying is estimated at 36 cents per ton of dry sludge containing [illegible] per cent. of water.

When dried to 20 or 25 per cent. water, the sludge may be easily transported by conveyors or elevators to a retort for destructive distillation at a high temperature. This retort may be of fire brick, but cast iron is preferable. It is oval in section so as to effect the best distribution of heat, is set vertically, and is slightly larger at the bottom than at the top so as to facilitate the downward movement of the sludge cake. The top of the retort is closed with an air-tight cup and cone arrangement, through which the sludge cake is fed at regular intervals. The bottom of the retort is similarly closed by a cone which can be operated to let out the spent residue from the distillation. The retort is heated by the combustion of gas in a combustion chamber and in flues passing around and up its sides, a spiral path being preferable. The volatile products of distillation are taken off toward the top of the retort through a pipe fitted to the side, the gases being drawn outward by an exhauster which maintains a slight suction in the pipes. These volatile products are then passed through a condenser and subsequently through a scrubber, which extract the moisture, oil and ammonia. The inflammable gas which now remains is passed into the combustion chamber of the retort and there burned. The heat obtained from the combustion of this gas is sufficient to maintain the retort at the desired temperature, but an auxiliary source of heat is also provided by a gas producer or furnace, which is used in starting the operation. The lower part of the retort is maintained at a temperature of 1,500 degrees to 1,800 degrees Farenheit. Steam is blown into the retort near the bottom and in passing through the hot zone reacts on the carbonaceous material, and in the presence of the lime in the sludge the nitrogen in the sludge is liberated as ammonia.

Products of Distillation

The products of the distillation are oil, ammonia, combustible gas and mineral residue. The oil is collected in a condenser combined with the ammoniacal liquor and is run off from the top of it by an oil-separating tank. The amount of oil obtained is much greater if a comparatively cool zone is maintained at the top of the retort. This oil is believed to be much more valuable than fuel oil. The ammoniacal liquor from the condenser and scrubbers is treated with sulphuric acid and converted into ammonium sulphate. It is estimated that the value of this ammonia should cover the entire cost of the disposal of the sewage. It is estimated that the value of this ammonia should cover the entire cost of the disposal of the sewage. The gas from the distillation is used in furnishing heat for continuing the distillation. The residue contains no organic matter, but the lime and phosphates in it make it valuable as a fertilizer and it is easily reducible to a fine powder. It is suggested that it could be used in connection with the lime employed as a precipitant, or that a fair quality of cement could be made from it. This residue amounts to about 50 per cent. of the solid material present in the sludge.

At Bradford, England, grease is extracted from the sludge, the pressed cake being then used as a fertilizer or being burned in furnaces. The sludge is lifted by compressed air from the sludge pit into open vats, where it is heated with waste steam from the engines and brought to the boiling point, at which tempera-

[illegible] it is forced by compressed air at 100 pounds pressure into the sludge presses, where the oil and water are pressed out in the ordinary way. The oil is drawn off from the water which escapes and is barreled and converted by its purchasers into olein, stearin (used for dressing leather and the manufacture of candles), and pitch used for insulating electric cables. The success of extracting the grease from sewage has led the city to add to the plant a digester costing $1,358 for extracting grease from condemned meats and carcasses.

In Huddersfield, sludge cakes, 80 per cent. moisture, are disposed of to a large extent by being cremated in a 2-cell destructor so arranged that all the gases pass through a fume cremator before reaching the open air. As a sufficient quantity of the drier town refuse to carry on the combustion is not obtainable, gasworks clinker and engine slack are used as additional fuel. In this city the pressing of a ton of sludge costs an average of about $1.25 per ton for labor, lime, fuel, etc., not including capital charges or cost of power.

Wet Carbonizing System

Huddersfield and other cities are considering the adoption of a system of wet carbonizing, the plant for which consists of a special furnace, presses, drying machinery, degreasing plant, bagging machinery and power plant. The sludge while under pressure is subjected to a temperature considerably above 212 degrees, but as there is no evaporation and the heating is recuperative, the cost of fuel is said to be reduced to a minimum. The carbonizing furnace consists of a number of tubes arranged in a horizontal battery, there being placed inside of each tube a smaller one of half its sectional area. All the inner tubes are revolved by mechanical means. One end of the battery of tubes projects into a gas-fired furnace, although any other system of heating could be employed. The sludge is conveyed to the cooler end of the outer tubes and passes through the annular space to the heated chamber at the further end, where it enters a header and is fed into the inner tubes, through which it passes back to the cooler end, where it is discharged into a tank. In this way the sludge, as it leaves the apparatus, is cooled by the entering sludge and at the same time warms this sludge, thus reducing the cost of heating it. In passing through the heated chamber the sludge is carbonized. From the carbonizer it passes to filter presses and the cakes formed by these drop into a hopper and are fed into a Ruggles-Coles dryer.

The gaseous products of combustion are collected by means of a fan and discharged into a condenser, where they are reduced below atmospheric temperature, so that the air leaving the scrubber is said to produce no offensive odor.

On leaving the dryer the sludge, which contains 5 to 8 per cent. moisture, is fed into a benzine degreasing plant, which consists of a larger container with agitated paddles and the necessary storage vessels, stills and condenser, which are said to extract the grease to within 1½ per cent. The residue is then bagged and sold as fertilizer.

At Glasgow and Other Cities

In Glasgow, Scotland, the pressed sludge has for a number of years been changed by what is known as the Melvin process into a powder or dust manure known as Globe fertilizer. Dublin, Ireland, is experimenting, on a small scale, with the Dickson process, which consists principally in heating the sludge in its raw state, then adding brewer's yeast, and subsequently drying it; the product being sold as a fertilizer.

At Oldham there was installed in the fall of 1912 a system invented by Dr. J. Grossmann and called by his name. In this process the sludge is pumped into specially designed draining tanks, where it is reduced to a slimy consistency, and from which it is taken by bucket elevators to a storage tank in the top of the building. From this storage tank it is moved by screw conveyors into six hoppers, each of which feeds a drying machine. The drying machines are long cylinders which are bricked in and heated by coal, in which the sludge is moved slowly from one end to the other at such a rate as to be completely dried when reaching the outlet. In this state it can be used as a fuel for creating the heat necessary for carrying on the process; but the complete process contemplates the distillation of it. Each dryer has underneath it a distillation retort into which the dried sludge passes directly from the dryer. In this retort it is mixed with a little acid, and a current of super-heated steam is injected through the mass as it passes along. The superheated steam removes all grease from the sludge and is later condensed and the grease separated from the condensation water. The residue is used as a fertilizer. The plant is housed in a building 120 feet by 45 feet by 30 feet high. The dryers are on the upper floor and the distillation retorts on the lower of the two floors into which the building is divided. The ground floor also contains two steam boilers, two steam engines and other machinery. The process is absolutely automatic from the time the sludge is introduced from the settling tank to the point where it leaves the distillation retort as fertilizer, and all the labor required is in looking after the boilers and machinery. No fumes can escape to the atmosphere and there is said to be absolutely no nuisance occasioned by the process. The total cost of the plant was $58,000.

Dynamite in Road Making

Recently a demonstration was given by the Du Pont Powder Company to the Los Angeles (Cal.) Park Department to show the value of dynamite blasting in hard ground as a substitute for plowing. They were using six mules to a plow and at each plowing were loosening only about eight inches of dirt. The blasters bored thirty holes six feet deep (to grade), four feet apart, and each loaded with two cartridges of dynamite. As a result of the blast the dirt was loosened to grade, making further plowing unnecessary.

What appealed to the officials was the time and money saved by the blasting, as compared with plowing, and the ease and speed of scraping made feasible. An equally important item was the large saving in time, at least nine plowings of the entire area would have been required to loosen the dirt moved by the blast at one time.

Although road contractors have commonly used dynamite for blasting rocky cuts in road work, the use of high explosives for moving gravel, clay or old roadbeds is a recent innovation that will probably be rapidly adopted.

Ability doesn't count; knowledge is useless; experience has no worth without the driving force of optimism. It's the steam that makes all the wheels go around—it's the sparking plug of the motor—it starts things.—Herbert Kaufman.

Road Construction in Saskatchewan

Classification and Details of the Work—Importance of Maintenance Adequately Recognized — An Outline of Future Developments

By A. J. McPherson, Chairman Provincial Highway Commissioners

IN 1907 there was spent in the Province on road improvements from Provincial funds $881,000.00 and from Local Improvement District sources $75,000.00 or a total of $1,456,000.00. In 1912 there was available for road improvement from Provincial sources:

Chargeable to current account	
For bridges	$140,000.00
For roads	225,000.00
Aid to Municipalities	172,000.00
Ferries and Inspection	62,000.00
Chargeable to capital account	
Bridges and Ferries	303,000.00
Road improvement	1,300,000.00
	$2,202,000.00
Raised and spent by Rural Municipalities from taxes and debentures approximately	1,500,000.00
	$3,702,000.00

In addition to this the cities are spending large sums in permanent pavements and the towns and villages in improving the streets within their limits. This looks like a large amount of money to be spent annually on the roads, but when it is remembered that south of Prince Albert which is almost wholly settled there are approximately 250,000 miles of road allowances, a large part of which must receive some attention, to enable the settlers access to markets from their farms it is easily seen where it is absorbed.

Class of Roads and Details of Construction

Up to the present there are very few places in the Province where anything more than improvements to make the best possible earth road are undertaken and it is only where gravel is easily available that short stretches of gravelled road have been constructed. In some of the older towns their main streets are gravelled and are kept in very good condition, but so far as the country roads are concerned almost without exception they are simply earth roads.

There are many places throughout the Province where the country has developed to a high degree and where in order to be consistent with conditions some better form of road than an earth road is warranted.

Settlement in other places has taken place rapidly, with the result that the necessary attention to the roads has not been possible and many obstructions exist and long stretches of almost or at times impassable roads prevent ready access to markets. The standard of road to be aimed at must necessarily therefore, vary for different localities but it is exceedingly advisable that as high a standard as possible should be set. In some localities gravel and broken stone roads should be constructed, while in others the removal or overcoming of obstructions and the construction of the best earth road possible is immediately advisable with the possibility of a better grade of construction in the near future kept constantly in view.

For many years the highest class of road that will be attainable generally over the country will be the best earth road that can be made. In this age where every proposal is put to the acid test of the question "Will it pay?" it is proper that it be applied to the construction and improvement of roads. In the more populous cities we find large sums spent in paving the streets with pavements regardless of cost and their expenditures are no doubt warranted by the results and and the amount of the traffic. On the other hand we find where there is very little traffic that no attempt at improvement beyond making the roads passable is attempted. The amount of money that we are warranted in spending to improve the roads must be in some measure proportionate to the traffic or to the resulting traffic after the improvement is made. It will be found that we do not always cheapen the cost of transportation by spending extravagant sums in improving roads with little traffic and the most expensive road may be one that has been improved beyond the needs of the traffic on it. There is no doubt but what loads can be hauled much cheaper over gravel or macadam roads than over ordinary earth roads but if we consider the cost of constructing such roads and then apply the interest and a sinking fund that will pay back the cost of the improvement in five or ten years as a charge on the traffic we will find that the cost of hauling may be by no means lessened. The cost of hauling farm products over our ordinary earth roads as it is usually done in this country is from twenty to thirty cents per ton mile. One way of reducing the cost of hauling is to increase the size of the load, use a wagon and a trailer and put four or six horses to draw seven or eight tons in a load. This is the method followed in the mountains where a great deal of freighting is done hauling supplies to the mines over very indifferent roads. If loads can be hauled both ways, so that there is no unremunerative trip to make, very

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cheap hauling is done over roads that in comparison with our ordinary graded prairie roads would be considered impassable.

I had occasion to have some packing done some years ago in the Yukon district. I found packing on horses at that time cost about 1-3 cents per pound per mile or about $6.00 per ton mile. This was with hay and oats at 8 cents per pound and other prices corresponding. By brushing out the trails and grading the side hills so as to make a road passable for a waggon at a cost of 2,000 to 3,000 per mile this haulage cost was reduced to $1,00 per ton mile. The interest on the cost of improving in this way and a sinking fund that will pay back the cost in seven or eight years which is considered about the life of a placer mining camp comes to about $400.00 per mile per year. The reduction in the rate for freighting according to the above figures is $5.00 per ton mile. If 80 tons per year were hauled over this road the reduction in cost would therefore pay for the improvement and when owing to the reduction in the cost of supplies for mining many otherwise unproductive properties became paying propositions and by this means a traffic of more like 80 tons per day resulted, it is seen how well warranted the expense was.

The same principles may be applied to the matter of improving ordinary prairie roads. Suppose by gravelling a road at a cost of $2,000.00 per mile the saving in hauling over it would be five cents per ton mile. This would likely be in the shape of the larger load that could be taken over it or the greater speed with which the same load can be hauled. With interest at 5 per cent. and the principal paid back in 5 years this improvement would be warranted if 10,000 tons or 350,000 bushels of wheat came over it each year without other traffic. If the road materials can be obtained and assembled at less than $2,000.00 per mile a less amount of traffic will warrant the improvement. It will be seen from the above that an earth road in its best condition may be the cheapest road for the traffic no matter how much money is available for road improvement. On the other hand it is also seen, especially if considerations that cannot be put into figures in this way are taken into account, that many of our leading roads would well warrant the expenditure of large sums in improving them to a higher standard than simply the best earth roads.

Maintenance

The maintenance of any road no matter of what material it is constructed is a definite case of "a stitch in time saves nine." The nearer the roads come to receiving constant attention the better and more economically will they be maintained. As the local authorities are in the better position to give the roads this constant attention, being as it were constantly on the ground, it naturally follows that the maintenance of the roads and bridges should devolve on them, and they should recognize this and provide for it. It will in most cases cost far more for any provincial employee to get to a place where some maintenance work is required than the actual cost of doing it when he gets there and the Provincial employees should therefore be asked to confine their attention to the work of construction and reconstruction alone.

As nearly all of the highways in the Province must continue for years to be simply earth roads, and as even at their best they cut up easily at certain seasons of the year the Government has been experimenting to find out the best methods of maintaining earth roads in their best condition. The experiments performed with road drags indicated that an ordinary road can be kept in its best condition after being properly constructed by running one of these drags over it periodically about six to eight times each season and a large number of them are now coming into use. It is found that the operation of the drag must be changed to suit different qualities of earth going to form the roads in different parts of the country, but use of them on any road will in a short time indicate the most successful way in which to operate them.

Future Developments

The Highway Commission of the Provincial Government are endeavoring to have the local authorities give special attention to their main lines of traffic and develop systems of roads which will enable any person living in the Province to have a good road direct into town from a point within a few miles of his place and to go directly from town to town. They give a tangible incentive to the local authorities to do this by assisting them or contracting with them to make improvements on roads that are considered part of such a system at the expense of the Commission. They also make improvements on roads that will form such a system with their own road building organization.

By linking up the main roads in these systems in the proper directions a provincial system will be evolved on which every person wishing to go from one point of the Province to another will have a ready means of doing it. The commission have this in view and the local authorities are in many cases showing their accord with it.

There is no reason why in some parts of the country the improving of the main roads in these systems to a higher standard cannot be undertaken and especially this provincial system gradually be constructed as gravel or macadam roads where the material is available.

It is the intention of the Commission to take such steps as to give an incentive to do this whenever suitable and to concentrate efforts as much as possible without sacrificing other considerations along this line so as to work out a proper provincial system of high class roads in a few years. Where proper material is scarce and expensive this may not be possible. With the object of overcoming this they are having experiments carried out to see if the ordinary gumbo clay scattered so widely cannot be treated in some way whereby it will have a greater resistance to traffic during wet weather and will not form into mud so readily. These experiments would indicate that there is some chance of success along these lines and they are having a sample piece of road built at present to try out a process of burning with straw which has been suggested.

Any information that is obtained from these efforts will be distributed as fast as it is found reliable to the authorities who are interested or may be able to use it.

The Commission proposes to make a special effort regarding the maintenance of roads in their best condition and feel that much can be done along this line.

The local authorities are becoming much interested in the work and are giving every evidence of taking hold of it with greater intelligence and knowledge each year and as they form almost the only means by which any improvement along these lines can be carried out it is very encouraging.

It is hoped by the co-operation of the various authorities in all this work and by keeping up the interest of the general public that the standard condition of the highways in Saskatchewan will be gradually raised, and that eventually the state of the highways will be such that it will be a pleasure at all times to travel over them, that they will entice people to go afield and become acquainted with their fellows and that they will thus be one of the means of ensuring to Saskatchewan a broad-minded, prosperous and happy people.

Bituminous Gravel Concrete Pavement

THE rapid growth of automobile traffic, and particularly the use of motor trucks for handling freight, has resulted in the need of a permanent pavement for main highways, one whose cost will not be prohibitive and yet that will prove durable under heavy wear. With the idea of providing such a pavement without infringing on patented treatments, Mr. Spencer J. Stewart, division engineer of the New York State Department of Highways, designed a bituminous gravel concrete pavement, described in a paper read before the American Association for the Advancement of Science.

This pavement consists of a mixture of asphalt and gravel in the proportion of 1 cu. yd. of loose gravel to an average of 20 gal. of asphalt, the gravel containing not less than ten per cent. of clay. The gravel is bank-run, the largest particles of which would pass a 2-inch screen, and contains sufficient fine materials to partially fill the voids.

The bitumen is a fluxed natural lake asphalt, with a penetration between 10 and 13 mm. when tested for 5 sec. at 77 deg. Fahr. on a No. 2 needle weighing 100 grams.

The gravel was heated in a mechanical revolving drier to a temperature of over 225 deg. Fahr., after which the asphalt, which was heated to not less than 275 deg. Fahr., was added and the mixture placed in a revolving mixer and thoroughly agitated until all particles were thoroughly and completely coated with the bituminous material. The mixture, with a temperature of not less than 250 deg. Fahr., was then shoveled from dumping boards upon the prepared bottom course of the road and raked with hot rakes to a uniform surface. After this treatment the pavement was rolled until thoroughly consolidated with a self-propelled roller weighing at least ten tons.

A ½-inch layer of gravel screenings containing not less than 10 per cent. of clay was then applied to the surface of the road. This layer was saturated with water and rolled thoroughly and continuously until a clay mortar had been obtained. This process filled all the surface interstices with a gritty and adhesive substance, which made the road practically "non-skid." The traffic in a short time drives away all surplus screenings, leaving a mosaic surface.

In constructing this pavement it is not considered wise to have a small percentage of voids. It was felt that the heat of the sun and the traffic would gradually consolidate the pavement, and that this would result in a comparatively smooth and even surface. In this way it was anticipated that the short wavy condition of pavements, in which the mineral aggregate is fine and the bitumen in larger proportion to the mineral aggregate than in the one above described, would be avoided. This theory has been substantiated in the results obtained from the roads recently built.

The gravel used in this pavement was Hudson River cementitious gravel. It is composed of calcareous sandstone, granite and quartzite, associated with a considerable amount of finer particles, together with a percentage of clay. This latter substance gives the gravel a high cementitious value, which is essential to the comparative permanency of the pavement. The clay acts as a catalyzer on the asphalt, making it more viscous, less volatile and also less brittle.

The success of this pavement, Mr. Stewart said, is largely due to the physical qualities possessed by the gravel that was used as the mineral aggregate.

This composition of gravel and asphalt retains the appearance and quality of the original gravel road. At the same time it has the added feature of comparative stability and resistance to wear such as is obtained with pavements of a more expensive class.

The average price bid by contractors for a pavement 2½ inches deep of this class has been 85 cents per square yard. From reports of engineers in immediate charge of the different contracts the percentage of profit has varied from 0 to 15 per cent. On this basis it is assumed that an engineer's estimate for this work should be 85 cents or 90 cents per square yard under similar conditions.

The cost of the mineral aggregate averaged $3.25 per cubic yard on the site of the work.

The cost of the asphalt averaged 15 cents per gallon on the site of the work. On one section of the work the contractor used a portable plant, moving it on an average of 1,000 feet, and transporting his mixture by means of horse-drawn steel carts. The results obtained by this method were more satisfactory than when other methods were employed.

Subsidence of land, to a serious extent, has resulted in the vicinity of Northwich, England, from the wholesale pumping of underground salt-laden water. The dry salt mining, formerly one of the main industries of this district, has been superseded by the introduction of brine flows into these mines. The saturated brine from these flows is pumped to the surface, where the salt is recovered by evaporation. The settlement due to the removal of this solid matter from below the surface has been accompanied by the collapse of buildings. In order to compensate the injured property owners, the government now levies a tax on all brine pumping firms in proportion to their output, and reimburses property owners with the funds thus secured.

ALL is not gold that glitters. By the same token one might observe that all is not antique that looks old. The reminder comes from an advertisement in a London paper which runs as follows: "Polisher and faker wanted for antiques. Permanent job for good man." Accompanied are directions informing prospective "fakers" where to apply for the job. It is stated with a delightful frankness that the work is in one of the famous cathedrals, much visited by tourists. Those of us who are experts at discriminating between the good and the bad in the line of antiques will derive much satisfaction, on our itineraries in the Old Country, from the reflection that some of our misguided travelling companions may be fooled into taking forbidden souvenirs of antiques that represent the art of a faker—a man who earns a commonplace living by turning new into old.

Economy of Motor Trucks in Engineering and Contracting Operations

By R. W. Hutchinson

A recent report prepared by the National Association of Automobile Manufacturers on the lines of industry which were most interested in the use of motor transportation disclosed the fact that in the engineering and contracting businesses there were 482 inquirers on motor trucks as against about 300 for the next closest industry.

These figures indicate the activity in the contracting field in investigating the opportunity for the utilization of motor transportation.

Another very healthy indication of the appreciation of motor transportation by contractors is evidenced by the frequent requests which motor truck manufacturers receive for the rental of trucks for any particular contracting work.

One of the most interesting examples of the value of the motor truck in the contracting business is shown in the traffic investigation recently made by the Transportation Cost department of the International Motor Company. The company in question, The Crescent Delivery Company, N. Y. C., is engaged in the sale and distribution of sand, gravel and broken stone. Its transportation equipment consists, in addition to horse-drawn trucks, of three Mack dump trucks of 7½ tons capacity each.

Conditions—All the hauling is done from the company's dock, at the foot of E. 35th St. (with very few exceptions). The materials are delivered for the most part in the downtown section, so that the hauls are short, the average distance being 2.95 miles. Time required for loading and unloading is reduced to a minimum. The various materials handled are carried in large overhead hoppers, which are kept filled by one stem and one electrically operated boom derrick, with clam-shell buckets. The trucks run underneath one of three hoppers, there being one each for sand, gravel, and broken stone, from which they are loaded, in a few seconds, by opening a swinging gate, or valve, in the bottom of the hopper. These gates are operated by attendants, so that the truck drivers remain on their seats, and move their trucks as soon as filled to make room for other vehicles, of which there are usually a number waiting in line. The other motor trucks, as a rule, are given precedence over the horse wagons, not being required to wait in line.

The unloading is accomplished with equal facility, on account of the power dumping bodies, although there are occasional slight delays when the drivers must see the contractor's foreman to ascertain where load is to be dumped, etc. These cases seem to be the exception.

The trucks, being confined to city work, are operated over uniformly good roads, excepting at the dock, where the accumulation of broken stones and the fact that more or less manoeuvreing is required, doubtless effect the tires to some extent, by abrasive action.

The only causes of delay are those noted above, which are almost negligible, and those due to congestion in traffic in the downtown section.

Equipment—The three trucks are of standard construction, having bodies of nominal five yds. capacity. By loading with a "crown" it is possible to load them with six yards. They were delivered with dual 42-in. x 6-in. tires, of block type, which have recently been changed to 42-in. x 5-in. triple tires, these being endless.

The trucks are geared for a maximum speed of 10.2 miles per hour the original 13-tooth sprockets having been changed to the present 11-tooth size.

Operation—The trucks are operated nine hours daily, in which time 6.7 trips are averaged. The trucks make an average speed of 9 miles per hour, not including traffic or other stops, while the actual speed, as governed by traffic conditions, is 7.3 miles per hour. The maximum speed, with engine limited to 1,000 r.p.m., is 10.2 miles per hour.

The average time required to load, from the time the truck arrives at the dock, until it leaves the office where drivers receive delivery slips, is 5 min. The average time for unloading is estimated to be 8 min.

The loads vary from 15,000 lbs. in the case of broken stone, to 16,200 lbs., for a full load of sand.

The condition of the three machines, at this time, is excellent and it is evident that they are well looked after, even to the extent of frequent washing and polishing of brass.

The drivers are better than the average and take good care of their machines.

Maintenance—The garage facilities are of the best, and the location of the garage, in E. 31st St., reduces dead mileage to a minimum.

No facilities are at hand for repair work, except light repairs, as there are no machine tools nor benches.

Ample provision for daily attention, such as oiling, greasing, and minor repairs and adjustments, is made by the employment of one mechanic, all of whose time is given to that work.

Practically no spare parts nor equipment are kept on hand, and in view of the close proximity to the service station, this seems unnecessary.

The figures for mileage, trips, etc., are based on the actual performance of the trucks for two weeks—from November 11th to 23rd, inclusive, and were obtained from authoritative sources. The figures for average speed are based on the observations under various conditions. All the above are summarized in the following table.

On two consecutive days, in the above period, the trucks averaged 60 miles per day, and, while this is considerably in excess of the general average, it was accomplished without unduly speeding, the machines not working overtime, so that it is apparent that the fact that the average daily mileage is 39.4 miles only is not due to any limitation of the machines, nor to loading and unloading facilities.

It seems to be the policy of the company to hold this equipment more or less in reserve to the horse wagons, and while the wisdom of this policy cannot be questioned in view of the fact that the horse equipment costs practically the same whether working or idle, it must be borne in mind that the condition is unfavorable to the most efficient performance of the trucks. On the days when the machines are kept busy the efficiency, or the ratio between 10-mile performance and cost of operation, including fixed charges, must certainly be considered better than that of the horse equipment.

Conclusions—The conditions as outlined above, disclose very little which is abnormal, or which would justify any dissatisfaction on the part of the owners. The short hauls, traffic delays, etc., are inherent in the business, but these are largely overcome by the exceptional facility with which the trucks are loaded and unloaded. The drivers are under efficient supervision, and there seems nothing in connection with the handling of the trucks, while in service, that is susceptible of any improvement.

The average consumption of gasoline for the period covered by this report, and since it was known that an investigation was in progress has been considerably less than what it was before, according to Mr. Warren, secretary of the company, and while no deduction should be drawn from this fact, it suggests a better check on this item of expense.

The particular value of this report is that it proves that short-haul service is equally as profitable for a motor truck as long-haul service when the loading and unloading conditions prevent the waste of time keeping a truck idle.

Cost of Operation of 3 7-ton Dump Trucks

Conditions—Average daily mileage 39.5 miles; average trips 6.7 miles; average length of haul 2.95 miles; average load 8 tons.

Assumption—300 working days per year; 11,350 miles per year (each truck); 100,000 miles life of truck.

Investment:	
Three 7-ton "Mack" dump trucks ...	$17,400,00
Fixed Charges:	
Interest on $8,700, at 6 per cent.	522.00
Insurance: Fire, 2% on 80% of value .	278.40
Fixed depreciation (exclusive of tires) on $15,450 at 10%	1,545.00
Wages at $22.50 per week	3,510.00
Garage at $20 per month	720.00
Total fixed charges	$ 6,575.40
Operating Charges	
Depreciation at 1% per 1,000 miles for all mileage in excess of 1,000 miles .	285.83
Maintenance at $.079 per mile (approximately)	2,821.00
Tires at $.0809 per mile	2,877.42
Gasoline at $.067 per mile	2,380.07
Oil and grease at $.013 per mile ...	468.00
Total operating charges	$ 8,832.32
Total cost per annum	15,407.72
Average cost per ton mile	.108
Average cost per day	17.12

A combined sprinkler and heating system is in use in a large cotton mill in New Bedford, Mass. The building is 237 x 300 feet in area, with a basement and one storey, covered by a saw-tooth roof. The sprinkler system is supplied by an 8-inch pipe from the yard mains and a steam pump. In the basement the entire sprinkler system is used for heating, no other heat being provided. The sprinkler heads are of the Grinnell glass-button type designed to melt at about 160 degrees Fahr. The hot water has an average temperature of about 200 deg. Fahr. and at times reaches a maximum of 225 deg. Fahr. According to Mr. Gorham Dana, of the National Fire Protection Association, over-heating of the sprinklers is prevented by placing them in offset pipes about 12 inches long and one-half inch in diameter. These offsets are three inches above the main pipe and connected to it by a one-half-inch elbow and nipple. It is said that the action of hot water on the iron pipe causes a segregation of free nitrogen from the air in the water, and this gas collects in the space adjacent to the sprinkler heads. The gas acts as an insulator, and as there is no circulation of water through the offset pipes, such heat as reaches them by conduction is radiated into the atmosphere before it has a chance to melt the fusible caps.

The addition of finely ground blast-furnace slag to an ordinary clay of moderate fatness is a simple means of producing an excellent vitrified ware suitable for stoneware and paving bricks and tiles, says The British Clayworker. The slag, being in the form of a ready-made frit, acts as a very energetic flux, and one which is not damaged by prolonged storage. The iron compounds and other colouring agents in the slag are not usually objectionable, as the colour they produce is an agreeable grey. The slag must be ground very fine as the particles are somewhat sharp and may form unpleasant specks if insufficiently ground. If the slag is bought in a coarse condition it should be crushed in stonebreakers, followed by a ball mill.

A fireproof file for Drawings designed by Messrs. Bollinckx, of Brussels, is described in the "Engineer," London. The store or file consists of a number of burnt earthenware tubes set solid in a concrete wall, with one opening of the tube fitted with a steel cover. The tubes are placed on thin sides, with a slight inclination toward the cover, thus perventing them from retaining any moisture or water forced into them around the covers in case of fire. This file has been in use four years, and it is said that the drawings kept in them are in remarkably good condition.

On March 31st the Dominion closed a year of unexampled prosperity. In all branches of the administration the results surpassed the best record of the preceding years. The trade of the Dominion, for the first time in its history, has reached the billion mark, showing an increase of $150,000,000 in round numbers. The revenue of $170,000,000 is greater than that of last year by $35,000,000, and, with an expenditure of $154,000,000, the Finance Minister will be able to show a surplus of from $15,000,000 to $20,000,000.

Thawing of switches and interlocking in severe weather has been accomplished on the Chicago Great Western Railroad, according to information given out by Mr. C. G. Delo, engineer maintenance of way, by the use of a gasoline torch. A heavy brass tube 2 in. in diameter and about 5 feet long is filled with gasoline. The gasoline feeds into a burner at one end, a pump at the other end putting it under sufficient pressure to cause it to feed in any position of the torch. The burner gives a hot flame, the size of which is controlled by a valve. The tube tank holds 3 quarts, which will last as many hours. The apparatus weighs 7 lb. when empty. It is manufactured by the Turner Brass Works, of Sycamore, Ill. It can also be used by fire departments for thawing out hydrants and water mains; by agriculturists for destroying insect pests, and in shops and foundries for various purposes requiring quick and intense heat.

Problems of Water Supply and Sewerage—4*

Fourth of a Special Series of Articles—Water Purification: Sedimentation, Use of a Coagulent, Filtration, Mechanical Filters, Chemical Treatment of Water, Disinfection

By W. Muir Edwards, M.Sc., C.E., Professor of Civil and Municipal Engineering in the University of Alberta

BROADLY speaking, the characteristics of a water supply that may have to be remedied might be classified as Physical, Chemical or Bacterial, and the treatments to which the supply may be subjected for this purpose might be divided into Sedimentation, Plane or with a Coagulent; Filtration, slow or fast; and Chemical Sterilization. In the latter class would be grouped the different methods whose activities are directed entirely against the bacterial content of the water. Certain of these treatments may affect, in a greater or less degree, all the objectionable characteristics of the supply whilst others are devoted mainly to correcting some one of the three. To obtain a comprehensive grasp of the subject it might be well to consider each method of treatment separately noticing meanwhile its special significance in regard to each of the troubles which may have to be rectified.

Sedimentation—The objectionable content of most public supplies occurs in the form of suspended matter. Such matter is distinguished from that in solution in that its inclusion in the content of the liquid is due to currents which, owing to their motion, have the capacity of upholding material which would otherwise tend to settle out. Midway in classification between suspended matter and that in solution is what is known as colloidal matter. This is matter so finely divided that a mere cessation of the currents will not cause it to separate out, and on the other hand, it cannot be considered as matter in true solution, as merely physical contact with surfaces will precipitate it. Bacteria themselves are really matter in suspension although so minute that gravity is not an active agent in their deposition. Nevertheless they may be entangled and carried down by settling particles and thus sedimentation in addition to its effect on the physical turbidity of the water may show also quite a marked bacterial purification.

The efficiency of sedimentation in clarifying a liquid depends not only on the time of quiescence but also on the size and shape of the suspended matter. The coarser particles will usually settle out in one to three days and may represent 75 per cent. of the total matter in suspension. The improvement in the turbidity of the water will not be in a corresponding ratio however as it is the finer particles which exert the greatest influence on the appearance of the water. If plane sedimentation be the only treatment used, then a storage capacity for two or three weeks' supply may have to be provided; even months of sedimentation will not remove the turbidity of some waters carrying finely divided clayey particles. If sedimentation be used as a preliminary treatment and is followed by some form of filtration the time of quiescence is to be finally determined only by experiment, but will vary usually from twelve to forty-eight hours. The bacterial purification accomplished during sedimentation varies greatly with the nature of the matter in suspension. In some cases it may run as high as 75 per cent. removal in three days' subsidence, whilst in another case, as shown in the experiments on the Mississippi River water at New Orleans, an equal period of sedimentation has little effect on the bacterial content of the raw water. The bacterial results noted here must not be confused with those due to storage in which a much longer time, three or four weeks, is involved.

Putting down the bottoms of the filters, showing floor forms and expanded metal reinforcing.

Forms for end walls and pillars in a filter basin.

Use of a Coagulent—In many cases where the matter in suspension is of such a nature that plane sedimentation for a reasonable time has little effect, a chemical is added to the water to form an artificial entangling medium by which the fine particles in suspension are massed together and so settle out more rapidly. This addition of a coagulent to the water was first used extensively as a preliminary treatment in mechanical or rapid filtration, but its efficiency is such that it is now used in the treatment of most turbid waters irrespective of what the final treatment may be. The chemicals most frequently used are sulphate of alumina, iron and lime.

The sulphate of alumina, when added to a water containing carbonates, and bi-carbonates of lime and magnesia, is decomposed, the sulphuric acid forming sulphates with the lime and magnesia, the carbonic acid gas being set free and the alumina uniting with the water to form a hydrate. This is a bulky gelatinous precipitate and forms an excellent coagulating agent. If too much sulphate is used the excess will remain dissolved in the water, a result which should be avoided on account of the possible injurious effects of the alum.

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*The 1st, 2nd and 3rd articles of this series were published in our issues of Feb. 12, [illegible] and Apr. 2 respectively.

In the use of iron the object is to obtain ferric hydrate, which is a flocculent precipitate and forms a satisfactory coagulating agent. To obtain this, ferric sulphate may be used in a similar manner to sulphate of alumina, but the process is costly. Metallic iron as in the Anderson process or a mixture of ferrous sulphate and caustic lime, in the form of milk of lime, may also be used. This latter process is especially adapted to waters which are naturally hard, as the process results in softening them somewhat. The cost is less than that of the sulphate of alumina process.

Lime may also be used as a coagulent, but as the precipitate formed is not of a gelatinous nature its efficiency is not so great. The amount of chemical added in any of these processes and the time of subsidence allowed, should be controlled by someone familar with the reactions involved and capable of adjusting the treatment to the variations in the content of the raw water.

Filtration—A very obvious way of taking out suspended matter is to pass the liquid through a strainer, the interstices of which are so small that the matter in suspension will be retained and the liquid only allowed to pass through. To do this on the large scale necessary in treating a public water supply requires a very large strainer and thus we have the built-up filter beds. These consist essentially of underdrains for carrying off the filtered water, a layer of coarse gravel which supports a layer of finer gravel, which in turn supports a layer of sand. This latter is the straining medium, the gravel acting as a support to the sand and preventing it from clogging up the underdrains.

When filters were first introduced in 1829 by Mr. James Simpson for the Chelsea Water Company of London, their function was that of a strainer only, their duty, which they discharged successfully, being to remove the turbidity of the water. Later on when to the chemical content of the water was attributed the power of producing disease and when the better analytical methods devised in 1870 showed that little chemical change was produced by filtration, this method of treatment was condemned. In 1885 however after the establishment of the germ theory of disease it was found that for some reason the sand filter was a remarkably efficient agent in the removal of bacteria and thus the method came into its own again.

An idea of the construction and appearance of a large filtering installation may be obtained from the series of photographs. In the first may be seen the large area required and also the methods of waterproofing and reinforcing the bottom; in the next the construction of the pillars which support the roof is shown and also part of the end walls of the filter basin. In the next picture a very good idea of the complete structure may be obtained, the first layer of coarse gravel being shown in place. The next shows the operation of "cleaning" the filter and finally a view of the whole plant is shown as it would appear to the ordinary sightseer.

The completed filter basin showing the first layer of coarse gravel over the underdrains

In the Roxborough filters of which the above are views, the filler of the filter consists of a 15-inch layer of gravel varying in size from 3 in. at the bottom to ¼ in. at the top, then a 1-inch layer of coarse sand and on top of this a layer of sand which will pass easily through a sieve of 4 meshes to the inch but which would be retained on a sieve of 80 meshes to the inch. This layer of sand is usually [illegible] inches deep to start with and is reduced to 20 inches by "cleaning." At each cleaning ½ to ¾ inches of the top layer is skimmed off and when the thickness of the bed has thus been reduced to 20 inches the skimmed sand is replaced, having been thoroughly washed meanwhile. The reason for the cleaning is that the deposition on the top becomes so dense that there is too great a loss of head in forcing the water through the filter. The intervals between cleaning depend upon the turbidity of the water.

The exact reason for the bacterial efficiency of a filter and the conditions in its operation which are essential for such efficiency are not yet entirely understood. One thing is quite certain and that is that the straining action of the interstices of the sand bed alone would be sufficient to account for the high bacterial removal since these organisms are so minute that they could easily pass through.

The completed filter. The picture shows the operation of cleaning. The hydraulic sand conveyor is seen in the foreground.

When water having some degree of turbidity is allowed to flow through such a filter the coarser suspended matter is retained on the surface. There is thus gradually formed a slimy, gelatinous coating or Schmutzdecke, as the Germans call it, consisting of inorganic and organic matter in which active bacterial life takes place. For some time in Germany especially it was held that to this top skin must be attributed the beneficial effects of the filter. This is certainly so when a filter is first used, but gradually as the filter ages there is also biochemical activity in the body of the filter and a growth forms on and between the sand grains. To the absorption of these minute sponge-like coatings rather than to the straining effect of the gelatinous coating [illegible] buted by Mr. T. M. Pennink, of Amsterdam, the bacterial efficiency of the filter. In fact Mr. Pennink considers that the filtering surface skin is often a source of trouble and cause of inefficiency rather than any real help toward the elimination of pathogenic bacteria. It has certainly been demonstrated that a filter improves with age and also that after such ageing has taken place the top layer may be skimmed off and the filter put in operation immediately without any marked decrease in its efficiency. [illegible] thing more than a mere mechanical strainer [illegible]

[illegible] rests largely upon biological causes. The sand is [illegible] only as a [illegible] support for the gelatinous films, holding them intact. The depth of sand is required to steady the action of the filter and prevent disturbances of this [illegible]

To some extent the hint at differences of opinion in high places may be somewhat out of place in a popular article such as the present one. However, whatever be the outcome of the discussion as to the exact modus operandi of the filter, there is no question of the efficiency of the process in taking a badly contaminated water and turning out a potable effluent. In the filters shown in the photographs the raw water was contaminated by sewage and showed a bacterial content averaging 14,000 per c.c., while the treated water averaged not more than 50 per c.c., among which no sewage bacteria were found.

How a completed covered filter looks from the outside. The Lower Roxborough filter plant in Philadelphia.

Sand filters such as have been so far described are usually operated at about 3 million gallons per acre per twenty-four hours and are known as "slow sand filters." To treat the supply for a large population requires quite a considerable area and the filling is expensive, as it must be carefully laid. To lower the initial cost an effort was made to increase the rate and so decrease the area of the filter. The result was the development in America of a type known as Mechanical Filters.

Mechanical Filters—A better name for mechanical filters would be "rapid sand filters." They are similar to those just described in that they use a bed of sand three or four feet in depth as the filtering medium, but they differ in that rates of 125 million gallons per acre per day are used, and also in that the whole method of operation is different. To accomplish the high rate of flow and secure the same bacterial efficiency a coagulent is added to the water. This coagulent under the high heads necessary for such a rate of flow quickly clogs up the sand bed to a considerable depth and hence some method of repeated and thorough washing of the filtering medium must be adopted. This is accomplished by mechanically stirring the sand and at the same time flushing out the filter from below with filtered water. This operation may have to be carried out every few hours. The cost of the necessary chemicals and the cost of supervision makes the maintenance charge per million gallons higher in this method than in the slow sand filter. In the latter case the maintenance necessary is not great. The result is that the cost per million gallons, if the maintenance charges be capitalized, as they should be, works out about the same for either treatment, roughly at $10.00 per million gallons treated.

In the early stages of mechanical filtration various patented devices were used and the filters were usually installed by companies controlling one or other of these devices. Latterly, however, the principle of a coagulent, the rapid rates and the frequent washing of the filtering medium have all been included in designs of different engineers, no patented system being used. In the early types circular tanks were used since this form was best adapted to the mechanical stirers then used. Now rectangular tanks are quite common, compressed air being used as the agitator. Different claims are made by makers of patented processes, but the essential features of the process are the more rapid rates allowable with the use of a coagulent and higher heads and the consequent saving in space and therefore in initial outlay.

Chemical Treatment of Water—As has already been pointed out, chemicals are added to water for the sake of the physical characteristics of the resulting precipitate. In this process there is at times also a chemical reaction brought about whereby color, due to dissolved organic matter, may be rectified. In the purely chemical treatment of a water however, it is the hardness of the water that is usually to be dealt with. This characteristic if high is objectionable for dietetic purposes, although a moderately hard water is really preferable to a soft water in this regard. But for boiler and laundry use a hard water is distinctly objectionable. For the former it means a much greater use of soap before suds can be formed and in the latter case the formation of a deposit on the boiler seriously interferes with its efficiency.

Hardness is due mainly to the solution in the water of certain salts of calcium and magnesium. These bases may form with carbonic acid soluble salts, which simple boiling will remove as the carbonic acid gas is driven off and the salts are formed into nonsoluble ones and so are deposited. The same effect is attained chemically by adding a substance, such as lime-water or milk of lime, which absorbs the carbonic acid gas and so throws down the objectionable salts in the form of a carbonate. On the other hand the bases joining with sulphuric acid may form soluble sulphates of lime or magnesia which are not affected by boiling and constitute what is known as the permanent hardness of the water. In order to get rid of them they are changed into carbonates by adding a chemical such as carbonate of soda. A reaction then takes place in which the sodium replaces the calcium or magnesium, as the case may be, and these latter take the place of the sodium, so that for instance in place of sulphate of lime and carbonate of soda there results carbonate of lime and sulphate of soda. Of these carbonate of lime is insoluble and is precipitated, whilst the sulphate of soda remains in solution in the water but does no harm. The whole question of softening then is one of the proper proportioning of the chemicals and the settling out of the resulting insoluble compounds. Such processes should always be under the control of someone who understands quite clearly the reactions in-

An emergency sterilizing plant installed between 10 a.m. and 3 a.m. the following morning.

volved. There are very many patented processes but the underlying principle is the same—the difference is mainly in the ingenuity displayed in bringing about the proper reactions and making the working of the process as "fool-proof" as possible.

Disinfection—It has already been pointed out that a public supply is popularly judged by those characteristics which may be judged by our senses, and of these more often by the degree of its turbidity. It has also been noted that as far as public health is concerned, this is not the important factor but that it is in the bacterial content of the water alone that the pathogenic organisms occur. It should also be clearly understood that in mechanical filtration especially the rate of operation is not governed by the ability to correct the turbidity but by the possibility of obtaining effluents whose bacterial content is not above a safe limit.

If then it were possible to attack directly these minute organisms which alone contain the disease germ we would obviously be getting right at the heart of the trouble. Such a treatment is aimed at in the different forms of disinfection now advocated. Of these many are possible although not commercially feasible. It might be sufficient to discuss three distinct types the sterilizing agent in the first two being the same, namely nascent oxygen. These three methods are (1) the use of hypochlorite of lime, or bleach, as it is commonly known, (2) the application of ozone, and (3) the employment of ultra-violet rays.

Bleaching powder is a mixture of calcium hypochlorite, calcium chloride and impurities. Its efficiency as a disinfectant due to the action of the hypochlorite, which decomposes slowly giving off oxygen and free chlorine. This free chlorine dissolves in the water, liberating nascent oxygen, to which is probably due the germicidal effect. If commercial bleaching powder be added to a water supply in quantities of from 6 to 10 pounds per million gallons, being thoroughly mixed with the water at a uniform rate, the spore-forming bacteria are inhabited in their growth and the pathogenic or disease-producing ones are exterminated altogether.

Ozone might be described as a more active state of ordinary oxygen. That is, if air be exposed to the discharges of high tension electric currents some part of the oxygen which is normally a molecule formed of two oxygen atoms, O_2 is made to assume the more active molecular grouping O_3. The ozone thus formed is a very active agent and is a strong germicide. There is no question as to the efficiency of the process,—the question is one merely of cost. The treatment was put in successful operation at Paderborn and Wiesbaden in Germany in 1899. The capital outlay was considerable and the working costs were high but the effluent was quite satisfactory. The treatment has also been installed in America. It does not appear to be any more efficient than the use of the nascent oxygen liberated by the chlorine in the hypochlorite treatment, and so far as the author knows, has proved more costly.

As illustrating another method of sterilization the use of the ultra-violet rays might be mentioned. M. Victor Henri has shown that by subjecting the raw water to the radiation from a Cooper-Hewitt Mercury-vapor lamp sterilization may be carried out on a large scale. The lamp is placed in the bend of a semi-circular trough through which the water is led. At Marseilles 130,000 gallons per day were sterilized with an expenditure of 120 watts per thousand gallons. The treatment may find a large field of activity in the future.

Mr Earle B Phelps, of Boston, who has probably done most to advance the science of disinfection of water supplies and sewage effluents in this country stated in a paper read before the Engineers Club of Philadelphia: "The two great fields which are open to water disinfection are the treatment of a very slightly or only occasionally polluted supply by disinfection alone, and the treatment of a more seriously polluted supply by the present methods at highly increased rates and by subsequent disinfection."

One great advantage of the hypochlorite treatment is the speed with which a polluted source may be disinfected and made safe. In the photograph accompanying this article is shown a temporary sterilizing plant put in under the supervision of the author in 17 hours after the Board of Health decided that the water supply was responsible for a bad typhoid outbreak. This plant ran until the permanent plant was installed the supply being quite safe ever since.

Should a municipality have access to an unpolluted source, at a reasonable cost, it may rejoice. But it cannot be too strongly stated that the public objection to "treated" water is backed merely by sentiment and a store of unfounded superstitions. If a municipality is willing to employ expert advice in design and, equally important, scientific oversight in operation there is absolutely no question that a water, unsuitable in its raw state, may be so treated that the effluent not only satisfies our aesthetic demands but fulfills all requirements for public health.

Canadian Railroad Development

Work will soon be commenced on the alterations of the Chateau Frontenac, Quebec, which are estimated to ultimately cost $2,500,000. Mr. F. S. Swales, of Montreal, is the architect for the C. P. R.

A western despatch states that in the course of the next few days steel on the main line of the Grand Trunk Pacific west of Winnipeg will have reached McBride, the next Divisional Point beyond Tete Jaune, and 50 miles further west.

Work on the new line of the C. P. R. from Agincourt to Smith's Falls, Ont., is being rushed with all possible speed and it is expected to have this line in operation by December next. The road between Agincourt and Toronto will probably be widened and double tracked by that time.

By May 1st four parties will be in the field for the North Railway from Lachute to Bell River, on the Transcontinental, a distance of 300 miles. These parties will locate the route, and it is hoped that sufficient work will be done to enable the first contract to be given out by Dominion Day.

The C. P. R. is erecting a new freight shed at Fort William with a capacity of 100,000 tons, owing to the increased volume of the business of the company. The new shed will be used for coal purposes and the coal will be loaded by means of an overhead gallery and a system of tunnels. It will provide employment for two hundred men.

The two headings of the C. N. R. Mount Royal tunnel are now linked up. One starts from the shaft at Maplewood avenue and the other enters Mount Royal from the west portal in the Model City. There was a difference in grade of less than 1-16th of an inch at the point of joining. There are thus two headings instead of three, and it is expected that these will meet in November next.

Mr. Morley Donaldson, Vice-President and General Manager of the Grand Trunk Pacific Railway, has announced that the Fort Garry Hotel at Winnipeg, the second in the company's projected chain of hotels across the continent will be opened on October 1st, or as soon as the formal ceremony can be arranged. The foundations of the McDonald Hotel, at Edmonton are practically all laid and work has been started on the superstructure.

One of the most important pieces of railway work in the world was let out by contract when tenders for the construction of the C. P. R. tunnel through Roger's Pass, B.C., were awarded at Winnipeg a few days ago. The tunnel will be over five miles long and besides reducing the grade from two per cent. [illegible] per cent., will greatly lessen the distance through the mountains. According to the statement of Mr. F. W. Peters, general superintendent of the B. C. division of the C. P. R., it will take from three to four years to carry this work to completion.

Now that the work of the Mount Royal tunnel has progressed so rapidly, plans are being prepared for the underground station and offices of the C. N. R. in Cathcart and Lagauchetiere Streets, Montreal. The underground station, which will extend the entire length and width of two blocks, will provide for the different lines of track and large platforms. The transcontinental trains will use this station, and to accommodate these it has been decided to construct platforms one thousand feet in length. Above this station will be the station buildings, the plans for which are being prepared by Messrs. Warren & Wetmore.

Definite announcement was made recently from the Winnipeg offices of the C. P. R., that this company would build sixteen large bridges in Western Canada this year. Many will be new structures, while others will replace single track bridges which it has been found necessary to remove owing to the double tracking of the main line now being carried on. A few of the more important ones are the Kildonan Red River bridge, 1,015 ft. long, near Winnipeg; the Pitt River bridge, 1,750 ft. long, near Vancouver; another over the South Saskatchewan River near Medicine Hat, which will be 1,013 ft. in length, and numerous others which will involve a total expenditure of millions of dollars.

It is reported that owing to the fact that within a year the Canadian Northern Railway will be able to handle grain from the west to Montreal and Quebec and from there over the Intercolonial Railway to St. John and Halifax, this company intend erecting six huge elevators between Port Arthur and Winnipeg, also a series of elevators between Winnipeg and Edmonton.

According to latest reports the Grand Trunk Pacific are rushing with all possible speed the construction of their transcontinental line and at present have about 7,000 men at work on the construction of the unfinished portion in Western Canada, between Tete Jaune, B.C., and Hazelton, B.C. In Eastern Canada the G. T. P. have large gangs of men at work between Winnipeg and Quebec completing the unfinished portions between these two cities and also between Edmundston, N.B., and Moncton, N.B., and the promise is now made by the contractors that the National Transcontinental will see completion between Winnipeg and Moncton by this coming September.

Fairbanks-Morse Company Extending

In the report of the Canadian Fairbanks-Morse Company Mr. Henry J. Fuller, president, states that the company have arranged for several extensions during the current year. One of these will be the erection of a new eight-storey building in Montreal, to be used as the head office of the company and the Montreal branch. Another will be the erection of a large warehouse in Vancouver, which will be by far the best building of its kind in the coast city. The company last year carried out a number of extensions, chief among these being the erection of a building sufficient to increase the output of plowing tractors four or five times. The most important development in the sales end of the business last year was in gasoline and electric motor trucks, agencies for which had been secured from some of the leading American manufacturers. This department and that of automobile accessories, Mr. Fuller expects to form a large and important part of the company's business.

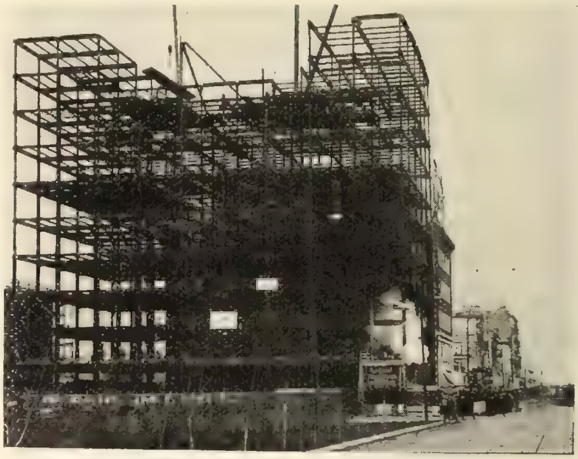
From the Saskatchewan Capital

Correspondence of The Contract Record

WITH bright sunny weather for over a week past, building operations are gradually broadening out, despite the fact that there is very little money in sight for loans except for property within the old city limits. All of the larger buildings are now well under way, and with plenty of laborers on hand the contractors have no difficulty in making good progress. The only thing that has occurred to mar this progress during the week just past is a strike on the part of a gang of men employed by R. J. Lecky. The strikers belonged to the Bricklayers' Union and objected to laborers being delegated to lay tile.

Hundreds of immigrants have already arrived in the city, and many more arrive daily. Homes have to be provided for them, and a number of contractors are confining their attention to this class of work alone. There is more or less of a scarcity of houses to rent, but some of the builders are erecting houses for sale on the rent-payment plan.

The R. H. Williams and Sons Company have made arrangements for the erection of an additional two storeys on their large departmental store, and for an addition 50 feet by 125 feet, five storeys in height. Work has already started on this building and an endeavor will be made to have it ready for occupation by October next. The same firm is contemplating the erection of a factory to manufacture some of the articles for which there is a heavy demand. Mr. Williams stated that it was likely that a site would be chosen at Pilot Butte a small place a short distance from Regina's boundaries.



McCallum Hill & Company's 10-storey building under construction at Regina. The city council has legislated against skyscrapers, ten storeys being the maximum height allowed.

The civic fire, light and power committee has recommended the city council to accept tenders for equipment for the new power house as follows: boilers from the Babcock-Wilcox Company, $53,150; stokers from the Stanford Rilly Stoker Company, $29,000; and draught fans to cost $7,100.

Arrangements have now been completed between the city council and M. B. Steine for the erection of a shirt factory to cost $25,000.

The Catholic Club building has now been completed, at a cost of over $40,000.

Steel-laying on the Regina-Boundary branch of the G. T. P. is now progressing very rapidly.

The work of extending the Canadian Pacific Railway yards has already begun. One hundred men have already arrived and many more are expected within the course of the next few weeks.

With the large amount of building work in progress, property values are on the rise, with the result that this year's assessment is expected to reach the large total of $80,000,000. Last year's figures were slightly under $55,000,000.

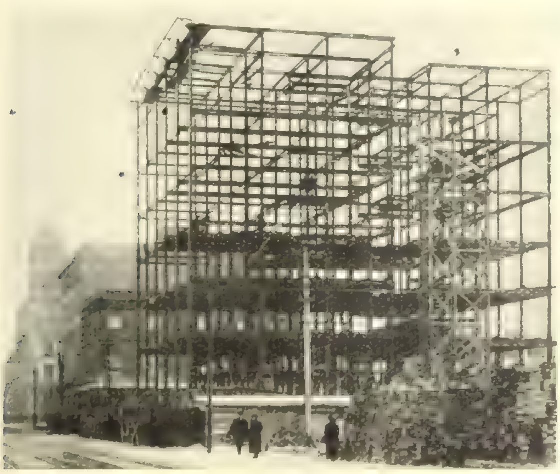
H. W. Hillman has purchased the old Y. W. C. A. site in Regina and will erect on it a 100-room hotel. The estimated cost of the building has not yet been announced.

An agitation has been going on in Regina for sometime past in favor of selling Dominion Park, and using the proceeds to buy a site and erect large grand stands, etc., for a sports ground.

The Lutherian Congregation of Regina will erect a church building at a cost of between $20,000 and $25,000. Arrangements to secure the necessary funds have already been made.

When the street lighting programme which has been outlined is carried out, Regina streets will be much better lighted than at the present time. The sum of $250,000 will be spent by the city in the immediate future.

The Labor organizations in Regina are planning the erection of a $50,000 labor temple. Messrs. Haultain, Cross, Jonah & Hugg are the solicitors. The Labor Temple Company, Limited, has been organized with a capital of $50,000.



Steelwork of the Canada Life Building in course of erection at Regina, Sask.

A 3-Million Dollar Contract

Fraser, Brace & Company, of New York, have secured the contract for the construction of the remaining portion of the work for the Cedars Rapids Manufacturing & Power Company. This undertaking is of great importance to Montreal, as it will mean the development of a hydro-electric scheme giving at least 100,000 horse-power. For several months the Company (controlled by the Shawinigan Water & Power Company, and the Montreal Light, Heat & Power Company) have had several hundred men at work on crib work, and Fraser, Brace & Company, will complete the canal and construct the power house at a cost of over $3,000,000. The work is to be completed by October 1st, 1914, and is to be done on a unit price basis. The hydraulic end of the scheme has been designed by Mr. Julian C. Smith, chief engineer of the Shawinigan Company, Mr. R. M. Wilson, chief engineer of the Montreal Light, Heat & Power Company, being responsible for the electrical machinery section. A portion of the equipment has already been purchased, including 12 units of water wheels [illegible] 120000 horse-power. The order for twelve generators has gone to the Canadian General Electric Company.

Mainly Constructional

The News in Brief—From Coast to Coast

The offices of the Canadian Society of Civil Engineers have been moved to 16 Mansfield Street, Montreal.

Lachute, P.Q., will spend $256,000 on civic improvements, including water works, drainage and electric lighting.

The City Engineer of Toronto recently laid before the civic works committee a plan for a grand boulevard to encircle the city.

Building permits issued this year at Regina to the end of March totalled $693,495, compared with $429,480 for the corresponding period of last year.

The Don Valley Brick Works have received a contract for bricks on the new civic abattoir at Toronto. They will supply enamelled, buff-pressed, wire cut and terra cotta brick and terra cotta fireproofing.

Among the estimates for the fiscal year ending October 31st, 1913, recently submitted to the Ontario Legislature by the Lieutenant-Governor was an item of $129,000 for colonization and mining roads.

Work now under way on the street railway system of Calgary will give that city 77 miles of track and 90 cars and it is expected that the system will be sufficiently large to accommodate a town of 100,000 people.

Extensive additions are to be made to the General Post Office at Toronto and some very valuable property will be expropriated. The new site will be three times the size of the present one and will occupy a space of 328 feet by 186 feet.

In view of the fact that the Toronto Municipal Council has granted the application of the Board of Education to provide an additional $600,000 for the new Central Technical High School, tenders have been accepted and no time will be lost in beginning work.

Mr. Allen C. Lewis, secretary of the Toronto Harbor Commission, recently stated that the plans and specifications of the breakwater construction in connection with the waterfront improvements were well under way and contracts would be let next month.

A social evening was held at the Builders' Exchange, Toronto, on April 16th. Mr. P. L. Fraser, the retiring secretary, was the guest of the evening. After various members of the Exchange had expressed their appreciation of Mr. Fraser, he was made the recipient of a handsome cabinet of silver.

The Waterloo County Council recently took an advance step in the good roads movement, and appointed Mr. M. D. Hallman, Berlin, Ont., County Road Superintendent, and Mr. H. J. Bowman, formerly County Clerk, County Engineer. Over $30,000 will be expended this year in improving highways throughout this county.

The Montreal City Council have decided to purchase twelve motor trucks of five tons capacity, including four Mack auto dumping trucks, which are represented in Canada by the Canadian Fairbanks-Morse Company. The trucks are [illegible] tion with the Public Works Department.

At a recent meeting of the Board of Directors of the Dahlstrom Metallic Door Company (controlling offices and factories at Jamestown, New York), Mr. James R. Kimball was appointed Sales Manager with headquarters at Jamestown. Previously to his connection with the Dahlstrom organization Mr. Kimball was associated with the [illegible]

Construction Company, also at Jamestown, for more than thirteen years, during which time he respectively filled the positions of district sales manager and special bank salesman. Within the last few years Mr. Kimball designed and personally supervised the sales of practically all the large bank installations made by the latter concern.

Sections of three Montreal streets are to be paved, as an experiment, with creosoted wood blocks, the Controllers having made the necessary arrangements with Mr. E. S. Clements, of Toronto, who represents a company manufacturing these blocks. Montreal tried the experiment some fifteen years ago, but the blocks rotted, owing to the severe climate and to the fact that the sap was not extracted from the wood.

The Water Commission of the town of Galt, Ont., recently made application to the Municipal Council to submit a by-law asking for $60,000—$40,000 to be spent in the construction of a new main, and $20,000 in extension to the system. Owing to the rapid development of the town the Commission think it necessary that steps be taken at once to give the business districts better fire protection and the outlying section a more adequate water supply.

A contract of more than ordinary interest is that awarded recently to J. & J. Taylor, Limited, by the Bank of Montreal, for steel vault doors and lining for installation in the London, Eng., office. The doors are to be built in the Taylor factory at Toronto and erected by the firm in the Bank's premises in London. This award not only reflects great credit on the manufacturer but shows in what high esteem Canadian-made goods are held in the Old Country.

A short time ago the Montreal Painters' Union asked for an advance to 40 cents an hour. This was refused, but a rise of 10 per cent. was offered. The union thereupon asked for 35 cents an hour, and as several masters declined to go beyond the 10 per cent., many men went out on strike last week, whereupon a settlement was made by a majority of masters on the lines of a maximum of 35 cents. The Builders' Exchange, however, decline to recognize the Union, and insist on an open shop.

A new standard price list on "Sterling" new code rubber-covered wire has been issued by the Standard Underground Cable Company, of Canada, Limited, Hamilton, Ont. The price list is in convenient and durable booklet form, printed in two colors, and gives prices on their "Sterling" wire for bases ranging from 13 to 20 cents for solid and stranded wire of all commercial sizes. Appended are explanatory notes and a list of electric wires and cables and cable accessories manufactured by this company. The price list will be sent on request to the company.

An old tunnel has been discovered at the foot of St. Lawrence Boulevard, Montreal. The tunnel leads from an ancient convent, and runs from the basement of the convent about one hundred feet parallel with Notre Dame street toward the cathedral. It is six feet two inches high and about three feet wide, and is hewn from the solid rock. Then it turns in the direction of the river. It is about thirty feet below the surface. There are other smaller passages branching off the main one and in one chamber a number of crosses, beads, etc., were found.

Mr. G. Janin, the chief engineer of the City of Montreal, has secured the larger part of the sidewalk and road work submitted for tender, the city's prices being about 17 per cent. lower, according to Mr. Janin, than those of the regular contractors. The Controllers have decided to make experiments with several kinds of artificial blocks for street pavements, these including Shawmut white blocks supplied by the Elder Ebano Asphalt Co.; Tidewater blocks, by Alexander Bremner, Ltd.; Metropolitan blocks, by Hyde & Sons; Bessemer blocks, by Stinson-Reeb Builders' Supply Co. The Board also resolved to purchase a large supply of scoria artificial paving blocks. It was decided to purchase from Mr. F. D. Lawrence 2,330,000 nine-inch blocks at $47.75 per 1,000, and 1,000,000 eight-inch blocks from the same firm at $43.25 per 1,000. It was likewise resolved to make a trial of a higher-priced artificial nine-inch block, by buying 42,000 from W. McNally & Co., Ltd., at $53 per 1,000, and 40,000 six-inch blocks at $43.40, from the same firm.

The Board of Controllers, Montreal, have decided to proceed with the widening and deepening of the aqueduct, and tenders have been called for the work, which comprises a length of 31,000 feet, and involves about 2,350,000 cubic yards of earth excavation, and about 436,000 cubic yards of rock excavation. Reinforced and unreinforced concrete retaining side walls, containing about 203,000 cubic yards of concrete, will also have to be built. The object of the enlargement is to carry out a scheme for generating power for pumping and lighting purposes in connection with supplying the city with additional water. Ten thousand horse-power will be developed, of which 6,000 will be utilized for pumping and the rest for lighting the city. The water will come from the St. Lawrence just above the Lachine Rapids, and it is estimated a 24-foot head of water will be obtained. The present pumping station will be remodelled, it being intended to do away with steam except as a reserve. The cost of the entire scheme will be in the neighborhood of 5,000,000 dollars. Plans for the electrical equipment will be made at a later date.

After receiving lists of wages from the Builders' Exchange and the Building Trades Council, the Board of Control of Montreal have decided upon the scale of wages to be inserted in all civic contracts dating from May 1. The rates represent an increase of about 10 per cent. on the previous schedule. The chief trades affected by the scale of wages are as follows:—Stone masons, 9 hours a day, 50 cents an hour; bricklayers, 9 hours, 55 cents; plasterers, 8 hours, 47½ cents, from June 1, 50 cents, and from September 1, 55 cents; lathers, 9 hours, 50 cents; tile setters, 9 hours, 45 cents; ornamental iron setters, 9 hours, 30 cents; plumbers and steam fitters, 9 hours, 37½ cents; helpers to same, 17½ cents; stone cutters, 8 hours, 45 cents; marble cutters, 8 hours, 40 cents; granite cutters, 8 hours, $3 a day; iron workers, 9 hours, 35 cents an hour; steel structural workers, 9 hours, 35 cents; painters, 9 hours, 40 cents; sheet metal workers, 9 hours, 35 cents; roofers, 9 hours, 35 cents; cement finishers, 9 hours, 45 cents; carpenters and joiners, 9 hours, 42½ cents; laborers for buildings, 9 hours, 27½ cents; ordinary laborers, 9 hours, 22½ cents; carters, $3.50 a day; carters double) $5.75 a day.

"The Millionth Meter"

The Neptune Meter Company, 90 West street, New York, is circulating a very attractive booklet entitled, "The Millionth Meter." This booklet forcibly conveys to the reader the exceptional enterprise of the Neptune manufacturers. The company started making these meters in 1892, and on March 4th, 1913, the million mark was reached. The sale of Neptune meters during the past four years has been remarkable. It took from June, 1892, to December 31st, 1908, to sell the first 500,000 of the Neptune Trident Meters, but only a little over four years from January 1st, 1919, to March 4th, 1913, was required to sell the second 500,000.

The splendid satisfaction gvien by the early installation has undoubtedly been responsible for the recent rapid sale of these meters. Improvement has been constant in their manufacture, but it has been carried out in accordance with a rigid standard of interchangeability, so that you can buy replacement parts to-day for Neptune Trident Meters made in 1893. Probably few manufacturing firms in any line of business can show a record of this kind.

B. C. E. R. Employees' New Building

The management of the British Columbia Electric Railway Company, Limited, have called for tenders for the construction of a building for the use of their motormen, conductors and shop employees who are stationed in Vancouver. The building will be located at the corner of Main and Prior streets, in the heart of the city and directly opposite the principal car barns in Vancouver and the repair shops maintained at that point. The block will be 25 feet by 60 feet in size, and five storeys in height. The type of construction will be of reinforced concrete with facings of brick and artificial stone. The estimated cost of the building is about $35,000.

New building for B. C. E. R. employees

There will be two entrances to the ground floor, one from Main street, and the other from Prior street. On the Main street frontage will be located the depot master's office and behind this, a large waiting room for the men. The entrance from Prior street is at the rear of the block, and leads to the elevator and stairways by means of which the upper storeys are reached. Above the ground floor the first floor will be used for lockers for the men, the second floor for a reading room, and the third floor for a billiard room, with room provided for one billiard and two pool tables. On the upper storey will be located the gymnasium for the men, the entire area of the floor being left clear for this purpose, and the room being 18 feet in height. The company will equip the gymnasium with a full outfit of apparatus. Lavatory accommodation will be provided on each floor, and shower baths are planned for the gymnasium. The entire building will be heated with hot water. Work will be started on the building at once, and it is planned to have it ready for use during the coming summer.

Montreal Real Estate and Builders' Show

By far the greater portion of the exhibits at the Montreal Real Estate and Builders' Show, held in the Arena, were those of real estate firms. The decoration of the hall was very artistic and the plan of the booths had a touch of originality. Many of the firms showed most elaborate models of the various properties, conspicuous among them being the C. N. R. model city, to be built at the termination of the Mount Royal tunnel. Included in the supply firms who had stands were the Canada Brick Company, represented by Douglas-Milligan, Limited. The company showed Dominion silicate bricks (manufactured at St. Lambert, P.Q.), which are uniform in colour and size. The Dominion bricks have only been on the market since the beginning of the year, but will be used in several important local buildings, projected or in course of erection. The National Builders' Supply and Enamel Concrete Brick Company, Limited, Montreal, exhibited specimens of their brick. This company have made tests with all kinds of sands in the Dominion, and hope to have their first plant at Mascouche, P.Q., working by June. Messrs. Ramsay and Kelly, Montreal, are the sales agents for the Province of Quebec. "Paripan," a British lacquer enamel, was exhibited by the United Supply Company, Montreal, while others who took space were the Window Strip Company and the Dutch Flooring & Chemical Company of Canada.

Personal Mention

Mr. F. J. Anderson, B.A.Sc., has been appointed City Engineer of Niagara Falls.

Mr. J. H. Lyons is now identified with the National Paving Company, Regina, Sask. Mr. Lyons was formerly engaged on the Toronto filtration plant.

Mr. R. H. Parsons, the newly appointed city engineer of Peterborough, Ont., was born at Grand Blanc, Mich, in 1875. After graduating from the University of Michigan he was employed for three years on the Pennsylvania Railroad on changes in line and grading in Pennsylvania and on track elevation work in Chicago. For a time also he was identified with the Maintenance of Way department. He resigned to engage on construction and survey work on the Algoma Central and Hudson Bay Railway, after which he accepted a position with the city of Ottawa as assistant engineer on main drainage, paving, etc. In 1905 he resigned to become superintendent in Toronto for the Warren Bituminous Paving Company. In the following year he went to Regina in a similar capacity for the same company. In November, 1906, he was appointed assistant city engineer of Ottawa, a position which he held up to the date of his recent appointment to Peterborough. Mr. Parsons is a naturalized Canadian and has great faith in the future of his adopted country.

Mr. R. H. Parsons, City Engineer of Peterborough, Ont.

Mr. Robert Howe, C.E., M.E., died at his home in Toronto a few days ago. For over twenty years the late

Mr. House had been chief engineer of the Canadian Underwriters' Association.

Mr. R. E. W. Hagarty is now located at Regina as local engineer for the Trussed Concrete Steel Company of Canada.

Mr. H. L. Fitzsimmons, of the Toronto City Engineer's Department, has been appointed building inspector of Prince Albert, Sask.

Mr. A. G. McFarlane, district engineer of F Division, Transcontinental Railway, died at Ottawa recently, aged 53. Mr. McFarlane had been engaged in railway work since 1890, and was with the Transcontinental since 1905.

Arthur H. Blanchard, M. Can. Soc. C.E., Professor of Highway Engineering, Columbia University, on April 10th delivered an illustrated address, entitled, "Modern Bituminous Pavements for Municipalities" before the Board of Trade of Elizabeth, N.J.

LETTERS

The Canadian Society of Civil Engineers—A Contribution from Victoria, B. C.

Editor Contract Record:

Your criticism of February 5th, entitled, "The Montreal Convention," is most opportune at the present stage of affairs in the Canadian Society of Civil Engineers.

The request of B. C. members of the Society to form a provincial section is based on a foundation of progressiveness and the urgent necessity for deeds in place of words.

The difference between eastern and western Canada is as great, in many ways, as between the Occident and the Orient, and it cannot be appreciated or understood except by experience; yet our governing body, apparently, has always a substantial majority of members, whose practical knowledge of local conditions in Canada, west of Winnipeg to the Pacific, may be expressed by the symbol "x."

In your issue of February 26th, our Past-President of 1912 gives an interesting letter on the subject and points out that several well known western men have been on the Council. True; but what percentage have they represented on each Council when it came to a vote Then look at the "net division of territory under by-law 35:—six districts EAST of Manitoba and one (No. 7) WEST of Manitoba! Possibly six-sevenths of the population and engineering development may be located east of Manitoba, but it is rather doubtful.

One of the strongest proofs of British Columbia's requirements is to be found in the Past-President's letter, where the employment of aliens is touched upon, as follows:—

> "It must not be forgotten that part at least of the British Columbia agitation was directed against the employment of a member of the Canadian Society of Civil Engineers, born in Canada, but now resident in the United States."

The B. C. engineers made their protest on the following grounds. The member referred to was recommended by citizens of this province who were not in touch with the profession and had no technical knowledge of the work to be done, which consisted of preliminary surveys for bridge location. The B. C. engineers realized that it was a mistake to bring in a specialist on bridge design from a foreign country, to undertake work which local engineers were able to perform quite as well, if not better. A further point raised was the following of alien assistants which such appointments always entails, with the result that our own citizens are often deprived of employment, to make room for outsiders.

The B. C. engineers have not come out in favour of a closed market. On the contrary, they have placed themselves on record as desiring to see the best brains employed on any large problems in engineering work, regardless of nationality. What they do ask, however, is that recommendations for the employment of such outside engineers shall come from those best qualified to judge, viz., the profession in Canada, instead of its being made a political matter; and also that a consulting engineer shall be confined to consultation and not be given power to supply engineers, regulate salaries and generally act the role of a conqueror in the British Empire.

It is true that many Canadian engineers (myself included), have found employment in the States, but not to any extent where public money has been involved, unless they have become naturalized there. And this brings us to the crux of our "agitation" in B. C., viz.:—That where the expenditure of public money is involved, in either government or municipal work, engineers who are British subjects shall have preference, provided they are competent.

I must also take strong issue with the statement: "We cannot very well object to the employment of a member of our own Society." This is a poor tribute to citizenship of the Dominion, giving it a par value of $12.00 per annum. The fact that alien engineers who do not reside in Canada, or share any of the country's responsibilities, belong to the Society, will never place their employment (at the expense of resident engineers) beyond criticism which is open and above board.

At the present stage of Canada's development, members of the engineering profession are nothing but pawns in the political game of chess. In order to convert these pawns into chessmen of greater influence we desire to form a Provincial Section in British Columbia, so that we shall be representative of the entire profession in this province in dealing with provincial questions.

I agree with Mr. H. Victor Brayley's letter published in your issue of February 26th (except where he absolves the Council from blame regarding the present state of affairs) and am pleased to add the total of one member to his minority.

Your Westmount correspondent should have looked up his map of Canada before stating that "engineers in other provinces are faced with exactly the same difficulty as those in B. C." A year's residence in British Columbia would convince him most thoroughly to the contrary.

In conclusion, it appears to me that the main danger to the Canadian Society of Civil Engineers at present is the tendency of Council to place too much value on the educational record of applicants and neglect the practical experience so necessary to make a competent engineer.

I, personally, have protested this matter for years past, but without any visible effect on the continued influx of "book learnin'" applicants, whose qualifications for the grade of "Corporate Member" do not comply with the by-laws of the Society, according to my interpretation thereof.

Finally, although acquainted with Professor McLeod only by correspondence, I wish to pay a passing tribute to his faithful service and devotion to the Society, from its inception, as Secretary. Although not always seeing "eye to eye" with him on points of detail, I quite appreciate that we owe him a debt which cannot be expressed in words.

R. W. Macintyre
(Secretary Victoria Branch.)

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Aylmer, Ont.

Tenders will be received by Town Clerk, D. C. Davis, until April 30th for approximately 22,928 sq. yds. reinforced concrete pavement; approximately 7,334 sq. yds. macadam pavement; approximately 2,497 sq. yds. brick pavement, with concrete base. Plans, specifications, etc., at office of Clerk.

Beaverton, Ont.

Paving and sidewalks contemplated by the town council. Clerk, C. A. Paterson. By-laws will shortly be voted on.

Calgary, Alta.

City Commissioners have estimates submitted for trunk sewers on 15th St. E. Blvd. S.E., along Nose Creek and C. P. R., 42 avenue, Victoria Park, Parkview and others. Cost $527,460. Clerk, J. M. Miller. Engineer, Geo. Craig.

Cochrane, Ont.

Sewage extension, cost $3,000, from 6th street north to small lake adjoining town, on to Mill lake and to a third lake, distance about 2,000 ft., 24 in. pipe a system of drainage will be installed. Mayor, W. S. Carter. Engineer-in-charge, Suttcliffe & Neylands, New Liskeard, Ont.

Watermain extension, cost $6,500, planned by town council. Mayor, W. S. Carter. Engineer-in-charge, Suttcliffe & Neylands, New Liskeard, Ont. 6 in. pipe on 8th, 9th, 10th, 13th and 14th avenues, length to be decided on.

Hull, Que.

Pavements planned on Notre Dame street, Division street and Laurier Ave. Asphalt and blocks. Mayor, Dupuis. City engineer, Mr. Laforest.

Leamington, Ont.

Tenders received by Clerk until May 1st, for construction of reinforced concrete reservoir 45 x 80 ft., 15 ft. deep and roof. R. M. Selkirk, clerk.

New Hamburg, Ont.

Waterworks, cost $25,000, planned. Three miles pipe 10 in., 9 in. and 6 in., water tower elevated and of concrete, capacity 50,000 gals., 90 ft. high, turbine pump, electric motor, covered concrete reservoir, hydrants, meters, valves required. Town clerk, J. F. Katzenmuir.

Orillia, Ont.

Sidewalks, cost $[illegible] contemplated by the town council. Clerk, C. E. Grant. By-law carried.

Ottawa, Ont.

Concrete sidewalks, contemplated by Town of Eastview, from Cummings Bridge to Notre Dame de Lourdes Church. Mayor, Mr. [illegible] McArthur road.

Regina, Sask.

Sewers and supplies. City engineer, F. McArthur. Tenders received by City Commissioners till May 15th, 1913, for supply and delivery of approximately: (a) 5,000 lin. ft. 6 in. sewer pipe; 50,000 lin. ft. 8 in. sewer pipe; 20,000 lin. ft. 9 in. sewer pipe; 1,500 lin. ft. 10 in. sewer pipe; 1,500 lin. ft. 12 in. sewer pipe; 2,500 lin. ft. 15 in. sewer pipe; 7,000 lin. ft. 18 in. sewer pipe; 2,500 lin. ft. 24 in. sewer pipe; (b) 1,735 lin. ft. 30 in. concrete pipe; 1,025 lin. ft. 36 in. concrete pipe; 1,300 lin. ft. 42 in. concrete pipe; (c) 450,000 sewer bricks; (d) 2,000 barrels cement (e) 260 manhole covers; (f) 1,000 cu. yds. sand; (g) labor for laying sewers. Specifications, etc., at office of Engineer.

Paving and sidewalks. City Engineer, F. McArthur. For (a) approximately 150,000 sq. yds. street pavement; (b) approximately 32,000 sq. yds. track pavement; (c) approx. 80,800 lin. yds. curb and gutter; (d) approx. 2,300 lin. yds. straight curb; (e) approx. 558,000 sq. yds. conc. sidewalk. Specifications, etc., at office of Engineer. Tenders received by City Commissioners till noon, May 15.

St. Thomas, Ont.

Water tower planned by City Council (Water Commissioners). Tenders will be received by Chairman, Board of Commissioners, Geo. K. Crocker, up to noon, April 30th. Tower to be 500,000 gallons capacity. Specifications, etc., from engineer, Jas. A. Bell, County Bldgs., and secretary, S. O. Perry.

Sudbury, Ont.

Tenders received by Clerk, Geo. Elliott, until May 1st. Specifications and plans at office of engineers and clerk. 7,000 ft. sewer, 20 ft., 18 ft., 15 ft., 12 ft., with accessories, pipe to be supplied by Town. Engineers, Chipman & Power, Mail Bldg., Toronto.

Weston, Ont.

Sewage disposal works planned by the Town Council. Tenders received by Clerk, J. H. Taylor, up to noon May 5th. Plans, etc., at office of Engineer, T. Aird Murray, 303 Lumsden Bldg., Toronto.

Weyburn, Sask.

Sewage filtration plant, well, etc. Secretary-treasurer, J. D. Murray. Tenders received by Clerk, until May 12, 1913, for contract 9, laying of approximately 3,376 lin. ft. 12-in. tile pipe sewer; 869 lin. ft. 10-in. tile pipe sewer; 6,618 lin. ft. 8-in. pipe sewer; 690 lin. ft. 8-in. cast iron water pipe; 7,743 lin. ft. 6-in. cast iron water pipe; 1,315 lin. ft. 4-in. cast iron water pipe. Contract 10, sinking well, 25 ft. diam., 32 ft. deep. Collecting gallery 10 ft. high, 5 ft. wide and 600 ft. long. Apparatus house and supplying and laying approximately 200 lin. ft. 12-in. and 550 lin. ft. 8-in. cast iron water pipe with all valves. Contract 11, building sewage filtration plant, approximately 115 ft. and 50 ft. Plans, specifications, etc., at office of Engineer, Norman Murray.

Winnipeg, Man.

Lead pipe. Tenders received by Secretary, M. Peterson, until April 24, 1913, for 80,000 lbs. ½-in. 145 ft. x 150 ft. lengths; 60,000 lbs. ⅝-in. in 150 ft. x 190 ft. lengths; 4,000 lbs. 1-in. in 170 ft. lengths. Plans, specifications, etc., at office of engineer, H. N. Ruttan, 223 James ave.

Yarmouth, N.S.

Extension to waterworks planned by Town Council. Clerk, Hiram Goudey. Ratepayers will vote on by-law May 6.

Railroads, Bridges and Wharves

Aldersyde, Alta.

Bridge contemplated by Dominion and Provincial Governments. Minister, Hon. C. R. Mitchell, Edmonton. Structural steel construction, to be erected across High River east of Aldersyde.

Calgary, Alta.

Car barn, cost $52,500, 9th street and 4th ave., contemplated by City Commissioners. Clerk, J. M. Miller. Superintendent of Railway, T. H. McCauley, estimates submitted for purchase of land, erecting car barn and equipping with tools.

Cayuga, Ont.

Bridge planned by Town Council. Clerk, J. W. Sheppard. Cement arch with four wings and iron rail, 16 x 8. Tenders will be called.

Evandale, N.B.

High water wharf planned by Dom. Government, Dept. of Public Works. Tenders will be received by Secretary, R. C. Desrochers, Ottawa, until May 12. Plans and specifications with Geoffrey Stead, District Engineer, Chatham, N.B. and at Department, Ottawa.

Guelph, Ont.

Tenders will be received up to April 26th by Board of Works and Sewerage Commissioners for: (1) steel foot bridge, consisting of 2 97-ft. deck spans, 1 through truss at 100 ft. and 6 I-beam [illegible] spans; (2) construction of concrete substructure for the above; (3) alternative tenders for a reinforced concrete bridge on same site. Plans, etc., from City Engineer. $5.00 deposit required for concrete bridge plans.

Kenora, Ont.

Lock and dam contemplated by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa.

Montreal, Que.

Car shop, cost $131,000, for C. P. R. Three storeys. Plans drawn.

Station planned for Can. Northern Railway in connection with the Mount Royal Tunnel. There will be an [illegible]

[illegible] station offices and express bldg. Architects, Warren & Wetmore, New York.

Port Hope, Ont.

C. L. O. & W. Ry. (C. P. R.) Co. has been authorized to construct bridge across G. T. R. at mileage 126.52 from [illegible].

Toronto, Ont.

[illegible] planned by Harbor Commissioners. Tenders received by Sec., A. C. Lewis, 76 Adelaide street west, up to noon May 28th, for dredging approx. 35,000,000 cu. yds. of material, 70 per cent. of which is sand and gravel and 30 per cent. sand, silt and clay. Dredges must handle 600 cu. yds. per hour, day and night operation required. Plans and specifications will be ready April 28th, work to commence August 1st. Further information from E. L. Cousins, Chief Engineer, Chairman, L. H. Clarke.

Winnipeg, Man.

Tenders received by Secretary, M. Peterson, until May 5, for conduit runs for 1913. Specifications at office of City Electrician, F. A. Cambridge.

Canadian Pacific Railway Company has been authorized to construct certain spurs for the Dominion Bridge Co., Ltd.

CONTRACTS AWARDED

Quaco, N.B.

Wharf, cost $16,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, Thomas P. Charleston, 179 Gilmour street, Ottawa.

Quebec, Que.

Steam ferry, cost $588,000. Dominion Govt., Dept. of Marine and Fisheries. Deputy Minister, Alex. Johnston, Ottawa. General contractors, Cammell, Laird & Co., Newcastle on Tyne, Eng.

Toronto, Ont.

Four concrete bridges, cost $3,700, for Markham Township. Clerk, C. H. Stiver, Unionville. Engineers, Bowman & Connor, 36 Toronto street. General contractors, Clements & Pipe, Berlin. Bridges, 26-ft., 28-ft., 30-ft. and 8-ft. culvert, on reinforced step.

Public Buildings, Churches and Schools, etc.

Berlin, Ont.

Hall and class room contemplated by Rev. F. Oberlander (in trust), 49 Queen St. N. Two storeys, 130 x 50. Plans in progress

Bracebridge, Ont.

Armory, $15,000, Manitoba road. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt., Dept. of Public Works. Plans with Capt. Warriner, Bracebridge. One storey, 80 x 130, stone foundation, common brick construction.

Cochrane, Ont.

Town Hall, cost $10,000, contemplated by the Town Council. Mayor, W. S. Carter. Clerk, H. Brown, Warrell Bldg. Plans in progress.

Calgary, Alta.

Police station, cost $160,000, planned. Clerk, J. M. Miller. Architects, Lang & Major, Board of Trade Bldg. Four storeys, 75 x 100, structural steel and sandstone construction, cement foundation. Two passenger elevators. Plans have been approved by City Commissioners.

Edmonton, Alta.

Incinerator, cost $140,000, contemplated by the City Council, to be attached to the power house on north or south side. Clerk, C. Cox. Engineer, A. J. Latornel.

School, Westmount Sub-division, 17 rooms, brick construction. Plans, specifications, etc., at office of Public School Board, who will receive tenders till May 1.

Hamilton, Ont.

Alterations to school, cost $75,500, planned by Board of Education. Secretary, R. H. Foster. Architects, Stewart & Witton, 2 Hughson street south. General contractor, W. H. Yeates, 24 Leeming street. Metal stairs, R. G. Olmstead & Son, 121 King William St. Eight room addition.

Burlesque theatre contemplated by a syndicate. Representative, Alex. S. Dickson, real estate, 36 James street. Plans will be prepared.

Kingston, Ont.

Interior fittings, post office. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt., Dept. of Public Works, until April 30th. Plans, etc., at office of Messrs. W. Newlands & Sons, Architect Kingston. T. A. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, and at Department, Ottawa. Specifications also at office of MacLean Daily Reports, Toronto.

Montreal, Que.

Alterations, Central Post Office fittings, contemplated by Dom. Govt., Department of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders will be called shortly.

Society hall, cost $7,000, Champ de Mars, for Wharf Laborers of Montreal, 201 Common street. Three storeys, 37 x 30, felt and gravel roofing. Plans drawn.

Stadium, Molson Estate, for McGill University. Secretary, W. Vaughan. Office, East Wing, McGill College. Plans prepared.

Ottawa, Ont.

Geodectic Survey Office Building. Tenders will be received by Dm. Government, Dept. of Public Works; Secretary, R. C. Desrochers, Ottawa, up to May 12. Plans, specifications, etc., at Department, Ottawa. Building on the Dominion Observatory Grounds, Ottawa.

Hall, etc., cost $8,000, contemplated by the Frances Willard Union of the W. C. T. U. per secretary. Plans will be prepared.

School, cost $14,000, Main street, will be erected by the Oblate Fathers, Main street. Cement foundation, brick and concrete construction.

Strathroy, Ont.

Addition and alterations to hospital, cost $6,000, contemplated by the Hospital Board. Chairman, Mayor Owens. Two storeys, 25 x 30, white brick construction. Plans will be prepared.

Toronto, Ont.

School, Williamson road, planned by Board of Education. Tenders received by Sec.-treas., W. C. Wilkinson, until April 25th, for all trades (8) except masonry and carpentry, for completion of school.

Addition to Post Office, Adelaide E., contemplated . Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, intend to expropriate 326 ft. of land on Adelaide street and 186 feet on Victoria.

Addition to Frankland School. Tenders received by secretary for (7) trades until April 25th. Board of Education. Secretary-treasurer, W. C. Wilkinson. Architect, F. E. Belfry, City Hall.

Board of Health have recommended the construction of a Measles Hospital near the present Isolation Hospital. Medical Health Officer, Dr. J. C. O. Hastings.

The Property Committee contemplates tearing down old St. Patricks Market, Queen street west, and erecting a new building. Mayor, H. C. Hocken.

School, Davenport and Osler, planned by Board of Education. Sec.-treas., W. C. Wilkinson. Architect, F. E. Belfry, City Hall. Tenders received by secretary until April 25th for heating and ventilating, plumbing, heat control and electric wiring.

Winnipeg, Man.

Temple, Portage ave., for the Loyal Order of Moose, 353 Broadway. Architect, J. H. G. Russell, 1110 McArthur Bldg. Nine storeys, structural steel, tile and brick construction. Plans in progress.

Stock judging pavilion. Tenders received by Provincial Government, Dept. of Public Works, Minister, Hon. Colin H. Campbell, until May 15. Pressed brick construction, stone foundation, Tyndall stone trimmings. To be erected in connection with the Manitoba Agricultural College. Plans, specifications, etc., at office of architect, V. W. Horwood, 261 Fort street, Winnipeg.

CONTRACTS AWARDED

Hamilton, Ont.

Cement block addition to church, cost $3,000, for St. Anne's R. C. Corporation. Architect, Robt. Clohecy, 226 John St. S. General contractor, T. J. Drake, 49 Earl street.

Theatre, cost $50,000, James St., for Griffin Amusement Co., 8 Queen St. E., Toronto. Architects, Redmond & Beggs, Kent Bldg., Toronto. Superintendent of Buildings, B. E. Richardson, 60 Market street, Hamilton. Owner is purchasing all materials and erecting building. Work in progress.

Alterations to school, cost $65,000, Barton street, Architects, Stewart & Witton, 2 Hughson street south. General contractor, W. H. Cooper, 67 York St. Metal stairs, R. G. Olmstead & Son, 121 King William. General contractor will sub-let contracts. 12-room addition. R. H. Foster, Secretary, Board of Education.

McNab, Ont.

School, cost $6,500, Grantham Twp. Architect, A. E. Nicholson, 46 Queen Street, St. Catharines. Mason, Frank Hoare, St. Catharines. Carpentery, Williams & Mesler, St. Catharines. Painting and glazing, Leach & Jones, 46 James street, St. Catharines. Plumbing and heating, S. P. Gourlay, 31 King St., St. Catharines.

Montreal, Que.

Society Hall, cost $5,000, Owner and builder, Courreur des bois Club, 745 St.

Valier. Two storeys, 25 x 80, cement foundation. Excavating done.

Post office, cost $24,950, St. Laurent. Architect, Chief Architect, Public Wks. Dept., Ottawa. General contractors, J. A. & R. Grau, St. Laurent P. O. Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa.

Paris, Ont.
Addition to post office, cost $10,000. Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, James Sinclair, Walnut street, Paris. Masonry, Tate Bros.

Prince Albert, Sask.
Palace, cost $20,000, for Bishop Newman. Architects, Creighton & Crowther, K. C. Bldg. General contractors, A. E. Cragg & Co., Box 1133. Electrical work, Prince Albert Electrical Co., 108 8th street. Two storeys, 50 x 50, cement foundation, brick and cement construction. Tenders being received by general contractor for painting, heating and plumbing.

St. John, N.S.
Extension to Hall for Knights of Columbus, St. John Council 9731. Architect, H. Claire Mott, 13 Germain street. General contractors, B. Mooney & Sons, Queen street. Excavating started.

Infirmary for Catholic Diocese, Sisters of Charity, c/o Bishop Le Blanc, Waterloo street. General contractors, B. Mooney & Sons, 112 Queen street. Carpenter, Edward Bates, 73 Duke street. Galvanized iron and metal, Jas. McSade, 51 Mill street. Painting, John Johnston, 103 Princess street. Iron and steel, Jas. Flemming Foundry, 130 Pond street. Work to start at once.

Shoal Lake, Man.
Municipal Hall. Secretary-Treas., F. Dobbs. rAchitects, Hooper & Davis, 501 Confederation Life Bldg., Winnipeg. General contractor, E. R. Snyder.

Winnipeg, Man.
Club House, cost $35,000, for The St. Charles Country Club, St. Charles, Man. Architect, G. W. Northwood, 502 Northern Crown Bank Bldg. General contractors, Wallace & Aikins, 283 Donald St.

Business Buildings and Industrial Plants

Amherst, N.S.
Piano factory planned for Amherst Pianos Ltd., c/o J. A. McDonald, 46 Barrington street, Halifax, N.S. Tenders called.

Berlin, Ont.
Candy and biscuit factory for C. H. Doerr & Co,. 138 Weber W. Three stys., 40 x 75. Plans in progress.

Blenheim, Ont.
Canning factory, cost $35,000, for British American Canners Ltd., 225 Lister Chambers, Hamilton. Architects, Watt & Blackwell, Lister Chambers, Hamilton. Two storeys and basement, 40 x 80, pressed and common brick construction, stone foundation. [illegible] elevator. Plans drawn.

Calgary, Alta.
Industry Housing Building, Ninth ave. and Fifth St. W., planned by City Council. Clerk, J. M. Miller. Six storeys and basement, 100 x 130, to provide accommodation for small industries which are not large enough to build properly equipped factory premises at first.

Collingwood, Ont.
Warehouse and grain elevator planned for T. Long & Bros., Ltd., Hurontario street. Architect, John Wilson, Hurontario street. Tenders received by architect for all trades.

Edmonton, Alta.
Office and stores, cost $50,000, for Bradburn & Thompson, Howard street. Architects, Magoon & MacDonald, 604 Tegler Block. General contractors, Reid, McDonald & Brewster. Three storeys, 50 x 150, cement foundation, structural steel and brick construction, Old buildings are being razed.

Grimsby, Ont.
Alterations and additions to store and hall for R. J. Snetsinger. Two storeys, brick construction. Plans drawn.

Hamilton, Ont.
Pattern storehouse and machine shop, cost $10,000, for Canada Steel Co., Sherman ave. north. Tenders received by architects, Prack & Perrine, 36 James St. S. One storey, cement foundation, pressed brick and structural steel construction.

Montreal, Que.
Private garage, cost $10,000, Cote de Neiges Rd., for W. Molson, Lake of the Woods Bldg. Two storeys. Plans drawn.

Warehouse, cost $10,000, Shannon St., for Phoenix Bridge & Iron Works, 83 Colborne street. One storey, 220 x 96, felt and gravel roofing. Plans drawn.

Dining Hall, cost $3,500, for Sisters of Good Shepherd, 350 Fellum street. 1-storey, stone foundation, frame construction. Plans drawn.

Warehouse, cost $3,500, 67 St. Catherine E., for H. Leroy, 198 McGill St. Five storeys, 127 x 24. Plans drawn.

Store and residence, cost $5,000, for D. Crevier, 3381 St. Hubert street. Three storeys, 58 x 20, felt and gravel roofing. Plans drawn.

Office building, 26-36 Nazareth street, contemplated by the Pedlar People, Ltd., 323 Craig street west. Architect not yet appointed. Site has been purchased.

Ottawa, Ont.
Alterations and addition to store and offices, cost $31,000, Sparks street, for Mrs. J. D. St. Denis Lemoine, 505 Wilbrod. Architect, W. E. Noffke, Central Chambers. Plans in progress.

Shop and residence, cost $6,000, Gloucester, for Clarence H. Lewis, 367 Nepean. Cement foundation, brick veneer construction. Plans drawn.

Portage la Prairie, Man.
Warehouse for the Twin City Oil Co., c/o Portage Development Co., has decided to locate distributing warehouse here.

Souris, P.E.I.
Roller flour mill. [illegible] Manager Klondike Lumber Co., contemplates placing roller mill in Souris in conjunction with his other plant.

Toronto, Ont.
Two stores and residence, cost [illegible] 000, Danforth, for Weismiller & MacKenzie Bros., 1431 Queen W. Two stys., 32 x 47, stone foundation, structural steel and brick construction. Plans drawn.

Warehouse and office, Queen & John for Methodist Book Room, 33 Richmond W. Architects, Burke, Horwood & White, 36 Toronto street. Eight to ten storeys, stone and cement foundation, structural steel and brick construction, Plans in progress.

Addition to factory, cost $5,000, for Canada Label & Webbing Co., 9 Morrow ave. One storey, 18 x 36, brick foundation, structural steel and brick construction. Plans drawn.

Addition to warehouse for Warwick Bros. & Rutter, 401 King St. W. Brick foundation, structural steel and brick construction. Plans in progress.

Messrs. Page & Warrington, Confederation Life Bldg., desire tenders for the general contract for erection of the National Cash Register plant at the corner of Christie street and C. P. R. tracks. Tenders close April 30th.

Bank building, cost $18,000, Pape and Danforth, for Union Bank of Canada, King W. Architects, Bond & Smith, 15 Wellington W. Two storeys, 35 x 40, stone and brick foundation, reinforced concrete and brick construction. Plans drawn.

Bank building, cost $6,500, for Bank of Ottawa, 14 Leader Lane. Architect, J. M. Lyle, 14 Leader Lane. Two storeys, 32 x 44, stone foundation, structural steel and brick construction. Plans drawn.

Tupperville, N.S.
Apple warehouse, cost $3,500, for Tupperville Fruit Co. 100 x 40, wood construction, stone foundation. Address Secretary, Chas. Bent, for further information.

Windsor, Ont.
Factory, cost $40,000, for Detroit Steel Products Co., Detroit, Mich. Acreage purchased and plans will be prepared.

Alterations to store and office, cost $8,000, for Barton & Netting Co. Tenders received by Architects, Crane & Pennington, Boug Building, until April 26th. Expect to install complete barber shop and pool room. One storey addition, 50 x 40, frame and brick construction.

Winnipeg, Man.
Alterations to office building, cost $15,000, Portage ave., for G. M. Black, 3 and 4 Wellington Apts. Building to be occupied by Union Bank and other offices. Plans drawn.

CONTRACTS AWARDED

Calgary, Alta.
Dry cleaning plant, cost $8,000, 7th ave. E., for Empire Cleaning Co. Builders, McDougal & Foster, Board of Trade Bldg. One storey, 25 x 48, brick, cement foundation. Excavating started.

Dundas, Ont.
Addition to glove factory for H. G. Smith. General contractor, M. H. Hewitt. Two storeys, 75 x 30, cement foundation, brick construction.

Hamilton, Ont.
Factory, cost [illegible], for [illegible] Co., Ltd., 185 Yonge street. Builder, W. H. Yates, [illegible]. Three storeys and basement, 114 x 53, brick and structural steel construction, cement foundation.

Addition to factory, cost $6,000, for Hamilton Cotton Co., 304 Mark St. N.

(Continued on page 72)

Tenders and For Sale Department

WEYBURN, SASK.

TENDERS

[illegible] J. D. Murray, [illegible] Tenders for Contract [illegible]," will be received up till **Monday, May 12th,** [illegible]

Contract 9.—[illegible] approximately—

- 2376 lin. ft. 12-in. diam. Tile Pipe Sewer.
- [illegible] 10-in. diam. Tile Pipe Sewer.
- [illegible]318 lin. ft. 8-in. diam. Tile Pipe Sewer.
- [illegible] lin. ft. 8-in. diam. C. I. Water Pipe.
- 7743 lin. ft. 6 in. diam. C. I. Water Pipe.
- 1315 lin. ft. 4-in. diam. C. I. Water Pipe.

Contract 10.—The sinking of a well, 25 feet [illegible] 32 feet depth, with collecting gallery 10 feet high, 5 feet wide and [illegible] house, and supplying and laying approximately 200 lin. feet of 12-inch diam. and 550 lin. feet of 8-inch diam. Cast Iron Water Main with all valves, etc.

Contract 11.—The building of a sewage filtration plant approximately 115 feet by 50 feet.

Plans and specifications may be seen at the office of the "Canadian Engineer," Winnipeg, and at the office of the Town Engineer, Weyburn, Sask. Form of tender and schedule of quantities will be supplied on application to the undersigned.

The lowest or any tender not necessarily accepted.

NORMAN MURRAY, Town Engineer.

17 J. D. MURRAY, Secretary-Treasurer.

Board of Education

Sealed tenders, whole or separate, addressed to the Secretary-Treasurer of the Board, will be received until

Friday Noon, April 25th, 1913.

for

Addition to Frankland School

All trades

Completion of Williamson Road School

All trades except Masonry and Carpentry

Carlton School

Heating and Ventilating, Plumbing, Heat Control, and Electric Wiring

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender, or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall, not later than 12 o'clock noon on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. O. McTAGGART,
Chairman of Committee.

W. C. WILKINSON,
Secretary-Treasurer.

17

CITY OF REGINA

SEWERS

Sealed tenders, addressed to the City Commissioners, Regina, Sask., will be received up until 12 o'clock noon, **May 15th, 1913,** for the following materials and work:—

(A) Supply and delivery of approximately:—
- 5,000 lineal feet of 6-in. sewer pipe.
- 50,000 lineal feet of 8-in. sewer pipe.
- 20,000 lineal feet of 9-in. sewer pipe.
- 1,500 lineal feet of 10-in. sewer pipe.
- 15,000 lineal feet of 12-in. sewer pipe.
- 2,500 lineal feet of 15-in. sewer pipe.
- 7,000 lineal feet of 18-in. sewer pipe.
- 2,500 lineal feet of 24-in. sewer pipe.

(B) Supply and delivery of approximately:—
- 1,735 lineal feet of 30-in. concrete pipe.
- 1,025 lineal feet of 36-in. concrete pipe.
- 1,300 lineal feet of 42-in. concrete pipe.

(C) Supply and delivery of approximately:— 450,000 sewer brick.

(D) Supply and delivery of approximately:— 2,000 bbls. of cement.

(E) Supply and delivery of approximately:— 260 manhole covers.

(F) Supply and delivery of approximately:— 1,000 cubic yards of sand.

(G) Labor for laying sewers.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender. The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

16-19 F. McARTHUR, City Engineer.

CITY OF ST. CATHARINES

Tenders for Pavements

Notice to Contractors

Tenders will be received, addressed to the Chairman of the Board of Works, City Buildings, St. Catharines, Ont., up to noon on **Wednesday, April 30th, 1913,** for the construction of permanent pavements on 18 streets as follows:—Russell ave., York street, Albert street, Vine street, Berryman ave., Lake street, Morris street, Lisgar street, Helliwell's Lane, Summer street, Park Place, Midland street, Centre street, Geneva street, Haynes ave., Clark street, and St. Paul street west.

The tenders may be offered for concrete foundation with curb and gutter, macadam foundation with curb and gutter of concrete, also for any street or bituminous surface or bituminous or Rocmac bound macadam surface, or the tenders may include foundation and any surface complete.

Plans and specifications may be seen at and form of tenders obtained from the office of the City Engineer. Envelopes containing tenders must be plainly marked as to contents.

All tenders must be accompanied by a marked cheque for 5 per cent. of the amount tendered, together with the names of two personal sureties, or the Bond of a Guarantee Company approved by the City Treasurer.

The Board reserves the right to let the contracts separately or in bulk or to reject the lowest or any tender.

W. J. NEAR,
17 City Engineer.

Tenders Wanted

Tenders are invited for plumbing, heating and ventilation of the H. A. Gray School, Edmonton, to be delivered on or before **May 1st, 1913,** accompanied by a ten per cent. accepted cheque, at the office of the undersigned, where plans and specifications may be obtained. The lowest or any tender not necessarily accepted.

EDMONTON PUBLIC SCHOOL BOARD,
17 Edmonton, Alberta, Canada.

CITY OF GUELPH

Tenders for Bridge Construction

Bids will be received up to 12 o'clock noon, on **Saturday, May 3rd, 1913,** by the Board of Works and Sewerage Commissioners for the following;—

1. Supply and erection of Steel Footbridge complete, consisting of two 97-foot deck spans, one through truss at 100 feet and six I-beam approach spans.

2. Construction of concrete substructure for the above.

3. Also alternative tenders for a reinforced concrete bridge at the same site.

Specifications, forms of tender and general plans may be obtained on application to the City Engineer's Office.

A deposit of $5.00 will be required for plans and specifications of reinforced concrete bridge. Deposit to be returned on return of plans.

Tenders to be sealed, endorsed only "Tenders for Heffernan Street Bridge," and addressed to the City Clerk.

17 T. J. MOORE, City Clerk.

Tenders for Dredging

Toronto, Canada

The Toronto Harbor Commissioners have in preparation plans and specifications for the removal of approximately 35,000,000 cubic yards of material by hydraulic dredging.

Borings indicate seventy per cent. of material to be sand and gravel, thirty per cent. mixture of sand, silt and clay.

Each dredge must be capable of handling at least 600 cubic yards per hour at maximum length of discharge.

From source of supply to point of discharge maximum distance is about 6,000 feet. Average length of delivery required about 4,000 feet.

Direct line of discharge preferred, but consideration will be given to work being done in series or by relays.

Day and night operation required.

The plans and specifications will be ready on April 28th, 1913. Tenders for all or part of the work will be received up to 12 o'clock noon, May 28th. Work to commence August 1st, 1913.

Borings, plans and specifications, tender forms, etc., and general information relating to the work can be seen at the Engineering Department of the Commission, 76 Adelaide Street West.

Communications relative thereto to be addressed to E. L. Cousins, Chief Engineer.

All tenders to be sealed and addressed to A. C. Lewis, Secretary, Toronto Harbor Commissioners.

The Commissioners do not bind themselves to accept the lowest or any tender.

17-19 L. H. CLARKE, Chairman.

TOWN OF AYLMER, ONT.

Tenders for Street Paving

Sealed tenders, addressed to the undersigned, will be received up to 6 p.m., **April 30th, 1913**, for approximately the following:—

2292S sq yds. of reinforced concrete pavement.
7334 sq. yds. of macadam pavement.
2497 sq. yds. of brick pavement with concrete base.

Plans and specifications may be seen at the office of the Town Clerk, Aylmer.

The lowest or any tender not necessarily accepted.

D. C. DAVIS, Clerk.
Aylmer, April 12th, 1913. 16-17

CITY OF REGINA

Pavements and Sidewalks

Sealed tenders addressed to the City Commissioners, Regina, will be received up until 12 o'clock noon, **May 15th, 1913**, for the following works:—

(A) Approximately 150,000 sq. yds. of street pavement.
(B) Approximately 32,000 sq. yds. of track pavement.
(C) Approximately 80,800 lineal feet of crub and gutter.
(D) Approximately 2,300 lin. ft. of straight curb.
(E) Approximately 558,000 sq. ft. of concrete sidewalk.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender.

The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

16-19 F. McARTHUR, City Engineer.

City of Moose Jaw, Sask.

TENDERS FOR
Valves and Hydrants

Sealed tenders, marked "Tenders for Valves and Hydrants," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following, F.O.B. cars Moose Jaw:—

65—6-in. Hydrants with turn buckle spindle. Two 2½-in. hose connections and one 3-in. steamer connection. All connections to have seven threads to the inch. Frost cases must be provided and have a depth of 8 ft. 2 in. The top of the main valve stem shall fit a 1½-in. triangular key and turn to the left to open
86 -6-in. gate valves and spindles.
50 8-in. gate valves and spindles.
10--10-in. gate valves and spindles.
35 12-in. gate valves and spindles.

Tenderers must submit detailed drawings and specifications of the hydrants and valves they propose to supply. No tender will be considered if this is omitted. Time of delivery must also be stated.

Each tender must be accompanied by a marked cheque in favor of the Corporation of Moose Jaw for five per cent. of the total amount of the tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

TOWN OF SARNIA
PROVINCE OF ONTARIO

Tender for Waterworks

Sealed tenders, registered, and clearly marked on the outside of the envelope: "Tender A," etc., as the case may be, and addressed to the Town Clerk, Sarnia, Ontario, will be received up to 9 p.m., **Monday, April 28th, 1913**, for the supply of material and the construction of:

Contract **"A"**—Labor laying approximately 11,700 feet of 24-inch force main.
Contract "B"—Furnishing all material for and constructing pumping station.
Contract "C"—Furnishing all material for and constructing infiltration basin and sluiceway.

Copies of plans and profiles, specifications and instructions to bidders, may be seen at the office of H. A. McLean, Town Engineer, Sarnia, or at the office of Chipman & Power, Engineers, Toronto.

No tender necessarily accepted.

DR. J. A. BELL, Mayor,
DR. W. A. HENDERSON,
Chairman Fire and Water Committee.
16-17 J. D. STEWART, Town Clerk.

City of Moose Jaw, Sask.

TENDERS
FOR
Cast Iron Pipe and Specials

Sealed tenders, marked "Tenders for Cast Iron Pipe and Specials," addressed to the City Commissioners, Moose Jaw, will be received up till twelve o'clock noon on **Wednesday, April 30th, 1913**, for the supply and delivery of the following material, F.O.B. cars, Moose Jaw:—

120	ft.	20-in. pipe
6000	ft.	12-in. pipe
1100	ft.	10-in. pipe
8620	ft.	8-in. pipe
23000	ft.	6-in. pipe
3000	ft.	4-in. pipe
40		6-in. off 6-in. Tees
32		6-in. off 8-in. Tees
7		6-in. off 10-in. Tees
10		6-in. off 12-in. Tees
2		12-in. off 12-in. Tees
6		8-in. off 12-in. Tees
6		6-in. x 6 x 6 x 6 crosses
6		6 x 6 x 8 x 8 crosses
2		6-in. x 6-in. x 10-in. x 10 in. crosses
5		6-in. x 6-in. x 12-in. x 12 in. crosses
2		10-in. x 10-in. x 12-in. x 12 in. crosses
1		10-in. to 12-in. increaser
150		6-in. offsetts
60		8-in. offsetts
10		10-in. offsetts
60		12-in. offsetts
50		6-in. plugs
25		6-in. caps
25		8-in. plugs
15		8-in. caps
10		10-in. plugs
10		10-in. caps
10		12 in. plugs
10		12 in. caps
6		6 in. 1/4 bends
6		6 in. 1/8 bends
6		8-in. 1/4 bends
6		8 in. 1/8 bends
[illegible]		10 in. 1/4 bends
[illegible]		10-in. 1/8 bends
[illegible]		12-in. 1/4 bends
[illegible]		12-in. 1/8 bends

All pipes to be class "C" and all specials to be class "D." All pipes and specials must conform to the standard specifications of the Canadian Society of Civil Engineers. Tenderers must state time of delivery and each tender must be accompanied by a marked cheque in favor of the Corporation of the City of Moose Jaw for 5 per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

TOWN OF WALKERVILLE

Tenders for Sewer and Sidewalks

Sealed tenders will be received, by registered post, addressed to the undersigned, up to noon on the **30th** day of **April, 1913**, for the construction of a Sewer on Lincoln Road, from the southerly line of Blocks 49 and 78, southerly to the southerly line of Block 52 and 75, in the Town of Walkerville. Also for Cement Sidewalks on each side of Lincoln Road between Erie street and the southerly line of Blocks 52 and 75. Also on each side of Erie, Huron, Ontario and Ottawa streets from the alley east of Lincoln Road to the westerly limit of the municipality.

Plans and specifications may be seen on application to Mr. Owen McKay, C.E., Walkerville.

Tenders must be accompanied by a marked cheque, payable to the Town Treasurer, equal to 2½ per cent. of the amount thereof. Should any party whose tender is accepted fail to execute the necessary contract and Bond for the due fulfillment of the same his deposit will be forfeited to the Town. Deposits of unsuccessful tenderers will be returned.

The lowest tender not necessarily accepted. The names of two responsible persons willing to act as securities must accompany each tender.

CECIL H. ROBINSON,
Town Clerk.
Walkerville, April 15, 1913. 17

City of Moose Jaw, Sask.

TENDERS
FOR
Tile Pipe and Specials

Sealed tenders, marked "Tenders for Tile Pipe and Specials," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon, on **Wednesday, April 30th, 1913**, for the supply and delivery of the following, f.o.b. cars, Moose Jaw:—

1500	ft.	20-in. pipe.
2000	ft.	18-in. pipe.
2800	ft.	15-in. pipe.
900	ft.	12-in. pipe.
8000	ft.	10-in. pipe.
23000	ft.	8-in. pipe.
40000	ft.	6-in. pipe.
1200	ft.	4-in. pipe.
26		6-in. off 20-in. Tees
90		6-in. off 18-in. Tees
50		6-in. off 15-in. Tees
15		6 in. off 15-in. Y's
20		6-in. off 12-in. Tees
10		6-in. off 12-in. Y's
350		6-in. off 10-in. Tees
200		6-in. off 10-in. Y's
500		6-in. off 8-in. Tees
400		6-in. off 8-in. Y's
6		4-in. off 18-in. Tees
5		4-in. off 15-in. Tees
15		4 in. off 10-in. Tees
45		4 in. off 8-in. Tees
125		4-in. Elbows
12		pieces 20-in. channel pipe
6		pieces 18-in. channel pipe
20		pieces 15 in. channel pipe
8		pieces 12 in. channel pipe
40		pieces 10-in. channel pipe
85		pieces 8-in. channel pipe
850		4 in. to 6-in. increasers.
800		6 in. 1/8 Bends.

All pipes and specials must be salt glazed tile. All pipe and specials over 12 in. to be of double strength. Tenderers must state time of delivery. Each tender must be accompanied by a marked cheque in favor of the Corporation of Moose Jaw for five per cent. of the total amount of the tender. The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

Tenders Wanted

[illegible] will be re- [illegible] including the **15th day of May, 1913**, for all trades required in the erection and completion of a Public Library Building at Walkerton, Ont.

[illegible] may be seen at the office of the undersigned, Walkerton, Ont., on and after this date, or at the office of Geo. Gray, architect, Harriston, Ont.

The lowest or any tender not necessarily ac[illegible]

JAMES WARREN,
[illegible] Chairman Library Board

CITY OF REGINA

Tenders for Trenching and Laying Water Mains

Sealed tenders, marked "Laying of Water Mains," will be received by the City Commissioners, Regina, Sask., up till noon, **May 12th, 1913**, for the Trenching and Laying of Water Mains, on certain streets in the City of Regina.

Specifications and other information may be obtained at the office of the undersigned.

A marked cheque covering 5 per cent. (five per cent.) of the tendered amount must accompany each tender.

Any or all tenders not necessarily accepted.

J. M. MACKAY,
17-19 Superintendent of Waterworks.

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, April 29th, 1913,** for the construction of the following works:—

SEWERS

Quebec Ave., from Bloor St. to Clara St.
Gothic Ave., from Quebec Ave. to Quebec Ave.
Clara St., from Conduit St. to Quebec Ave.
Gordon Ave., from 132 ft. N. of Heath St. to Glen Ave.
Mount Royal Ave., from Davenport Rd. to Alberta.
Thome Cres., from Mount Royal to Burlington.
Biggar Ave., from 320 ft. E. of Oakwood to Alberta.
Alberta Ave., from Davenport Rd. to St. Clair Ave.
Clinton Pl., from Clinton St. to 269 ft. west.
Lane 1st S. Dundas, from Medland to Pacific.
[illegible] No. 3

Supply of 16 inch Cast Iron Pipe

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Sewer Section, Works Department, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto) or in lieu thereof, the Bond of a Guarantee Company approved of as aforesaid.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily ac[illegible]

H. C. HOCKEN Mayor,
Chairman, Board of Control.
City Hall, Toronto.
April 17th, 1913. 17

TENDERS

Sealed tenders, marked "Tender for Departmental Building," and addressed to the undersigned, will be received at this office up to noon on **Saturday, May 10th, 1913,** for

Additions and Alterations

to the Departmental Building, corner Hollis Street and Cheapside, Halifax, N.S.

Drawing and specifications may be seen at the Department of Public Works and Mines, and at the office of Herbert E. Gates, Architect, Halifax, N.S.

Tenders must be accompanied by a certified cheque for 5 per cent. of the amount of the tender.

The lowest or any tender will not necessarily be accepted.

E. H. ARMSTRONG,
Commissioner Public Works & Mines.
Halifax, N.S., April 15, 1913. 17-18

Regina Public School Board

TENDERS

Tenders, sealed and endorsed on envelope, "Tender for Plumbing, Heating and Ventilating Benson School, Regina," will be received by the undersigned up to 12 o'clock noon, **May 2, 1913,** for work and material required in the plumbing, heating and ventilating of the above school, Block 56, Belvedere, Regina, Sask.

Each tender must be accompanied by a marked cheque for 5 per cent. of the amount of the tender, made payable to the Chairman of the Public School Board, the successful tenderer to have this cheque returned upon furnishing satisfactory bond for ten per cent. of the amount of the contract, conditional for the due and proper performance of the work. The deposit of the unsuccessful tenderers will be returned when the contract is signed.

The right to reject any or all tenders or to waive any defects or irregularities therein, is to be at the discretion of the Board.

Plans, specifications, form of tender and all information may be obtained on application to the consulting engineer, W. E. Cox, 3 Alfred Building, Winnipeg, or to the undersigned.

J. H. PUNTIN, Architect.
308 Darke Bldg., Regina. 17

City of Moose Jaw, Sask.

TENDERS FOR

Manhole Frames and Covers.

Sealed tenders marked "Tenders for Manhole Frames and Covers," addressed to the City Commissioners, Moose Jaw, will be received up to twelve o'clock noon on **Wednesday, April 30th, 1913,** for the supply and delivery of the following material, F.O.B. cars Moose Jaw. Local tenderers must bid on the material delivered at the City Store Yards.

160 valve chamber frames and covers.
100 manhole frames and covers.

Detailed plans and specifications may be obtained on application to J. Antonisen, City Engineer, Moose Jaw.

Time of delivery must be stated.

Each tender must be accompanied by a marked cheque, payable to the City Commissioners, for five per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Dated at Moose Jaw,
This 1st day of April, 1913. 15-17

THE CITY OF CALGARY

Sealed tenders, marked "Tenders for Municipal Laboratory Equipment," addressed to the City Commissioners, will be received at the office of the undersigned, up to 5 p.m. of **May 7th, 1913**, for supplying the City of Calgary with apparatus, equipment and supplies for a Municipal Testing Laboratory.

Specifications and particulars may be obtained on application at the City Clerk's office.

The lowest or any tender not necessarily accepted.

J. M. MILLER, City Clerk.
Calgary, Alta, April 18, 1913. 17-18

CITY OF REGINA

Sealed tenders, registered and clearly marked on the outside of the envelope "Tender for Power House Equipment," and addressed to the City Commissioners at Regina, will be received up until noon of **May 15th, 1913**, for the supply of:—

One pair vertical boiler feed pumps; each pump's capacity to be 7,500 imperial gallons per hour.

One combined open heater and meter, capable of handling 125,000 lbs. feed water per hour.

Copies of specifications may be had from Mr. E. W. Bull, Superintendent of Light and Power, Regina, Saskatchewan. A marked cheque for five per cent. of the amount of bid must accompany each tender.

The City Commissioners reserve the right to reject any or all tenders. 17-18

The Commissioners of the Transcontinental Ry.

Notice to Contractors

Tenders for Station and Other Buildings

Sealed tenders addressed to the undersigned and marked on the envelope "Tender for Station and other Buildings," will be received at the office of The Commissioners of the Transcontinental Railway, at Ottawa, Ont., until 12 o'clock noon of the **1st day of May, 1913**, for the erection of Station and other Buildings along the line of the Transcontinental Railway, as set forth below, viz:—

Section No. 19. From Mile 57 to Mile 105.5 West of Weymontachene in the Province of Quebec.
Section No. 20. From Mile 116.5 to Mile 159.5 West of Weymontachene in the Province of Quebec.
Section No. 21. From Mile 166 to Mile 214.8 West of Weymontachene in the Province of Quebec.
Section No. 22. From Cochrane 150 miles Eastward, in the Province of Quebec and Ontario.

Plans and specifications may be seen, and full information obtained at the Office of Mr. Gordon Grant, Chief Engineer, Ottawa, Ont., and at the following District Offices:—

For Sections No's 19 and 20. Mr. A. E. Doucet, District Engineer, Quebec, P.Q.
For Sections No's 21 and 22. Mr. T. S. Armstrong, District Engineer, Cochrane, Ont.

Tenders must be made on the forms supplied by the Commission, and be signed and sealed by all the parties to the tender, and witnessed, and be accompanied by an accepted cheque on a Chartered Bank of the Dominion of Canada, payable to the order of The Commissioners of the Transcontinental Railway, for a sum equal to ten per cent. (10 per cent.) of the amount of the tender.

The right is reserved to reject any or all tenders.

By order,
P. E. RYAN,
Secretary.

The Commissioners of the
Transcontinental Railway,
Dated at Ottawa this 11th day of April, 1913.

Newspapers inserting this advertisement without authority from the Commissioners will not be paid for it.—39976. 17

Tenders for Pavement

Sealed tenders will be received by the undersigned up to 3 o'clock p.m., **Monday, May 5th, 1913,** for the construction of approximately 6,630 square yards of pavement, 2,150 lineal feet concrete curb and gutter, and 1,500 lineal feet of concrete gutter.

Plans and specifications may be seen, and all other information obtained at the City Engineer's office.

A marked deposit cheque of 5 per cent. is required.

The lowest or any tender not necessarily accepted.

R. J. McCLELLAND,
City Engineer.
April 18th, 1913. 17-18

REGINA PUBLIC SCHOOLS

TENDERS

Tenders, sealed and endorsed on envelope, "Tenders for Plumbing, Heating and Ventilating Wetmore School, Regina," will be received by the undersigned up to 12 o'clock noon, **May 2, 1913, for** work done and material required in the plumbing, heating and ventilating of the above school, Block 53, Broder's Annex, Regina, Sask.

Each tender must be accompanied by a marked cheque for 5 per cent. of the amount of the tender made payable to the Chairman of Public School Board, the successful tenderer to have this cheque returned upon furnishing satisfactory bond for ten per cent. of the amount of the contract, conditional for the due and proper performance of the work. The deposit of the unsuccessful tenderers will be returned when the contract is signed.

The right to reject any or all tenders or to waive any defects or irregularities therein, is to be at the discretion of the Board.

Plans, specifications, form of tender and all information may be obtained on application to the Consulting Engineer, S. S. Kennedy, 211 Carlton Building, Winnipeg, or to the undersigned.

J. H. PUNTIN, Architect.
308 Darke Block, Regina, Sask. 17

Sealed tenders addressed to the undersigned, and endorsed "Tender for Geodetic Survey Office Building, Ottawa, Ont.," will be received until 4 p.m., on **Monday, May 12, 1913**, for the above mentioned building on the Dominion Observatory Grounds, Ottawa, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department.

Persons tendering are notified that tenders will [illegible] forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

[illegible]

[illegible]

Department of Public Works,
Ottawa, April 16, 1913.

[illegible] Department 36733 17-18

Tenders Wanted

CITY OF HAMILTON, ONT.

West End Sewage Disposal Works

Tenders will be received by registered mail only, addressed to John Allan, Mayor, Chairman Board of Control, up to 10 a.m., **Tuesday, May 6th, 1913**, for the construction of reinforced concrete sewage tanks, conduits, sludge drying beds, pile foundations and all other structures required for the complete erection of the west end sewage disposal plant.

Plans, specifications and form of tender may be obtained from the City Engineer, Hamilton, Ontario, upon receipt of $10, which amount will be refunded on return of the plans in good condition.

Lowest or any tender not necessarily accepted.

S. H. KENT, City Clerk.
Hamilton, Ont., April 17, 1913. 17-18

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect. No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Regina Public School Board

TENDERS

Tenders, sealed and endorsed on the envelope, "Tenders for Plumbing, Heating and Ventilating Victoria School, Regina," will be received by the undersigned up to 12 o'clock noon, **May 2, 1913,** for work and material required in the plumbing, heating and ventilating of the above school, McIntyre Street, Regina, Sask.

Each tender must be accompanied by a marked cheque for 5 per cent. of the amount of the tender made payable to the Chairman of the Public School Board, the successful tenderer to have this cheque returned upon furnishing satisfactory bond for ten per cent. of the amount of the contract, conditional for due and proper performance of the work. The deposit of the un[illegible]

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Board.

Plans, specifications, form of tender and all information may be obtained upon application to the Consulting Engineer, W. E. Cox, 3 Alfred Building, Winnipeg, or to the undersigned.

J. H. PUNTIN, Architect.
308 Darke Bldg., Regina, Sask. 17

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
C **1515 Rockefeller Bldg., Cleveland, O.**

FOR SALE

Dredge and Derrick and Tug, Portable Crusher, and 20 horse power Boiler and Engine, 12-ton Case Roller, "steam steerer," 19 Dump Waggons, Wheel and Drag Scrapers, Shovels, Hammers and Picks. All in good working order and cheap. Apply to H. A. Camjaigne, Niagara House, Niagara Falls, Ont. 10-T.F.

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

Concrete Mixer Wanted

Wanted, small batch steam or gasoline power Concrete Mixer, state full particulars and price to The Rob Roy Cereal Mills Co., Limited, Durham, Ont. 17

Wanted to Purchase

A second-hand No. 3 Thew Automatic Shovel, also a 3-drum 9 x 12 Hoisting Engine and Boiler or without Boiler, also pair of Swinging Engines. Name your lowest cash price and where plant can be inspected.

National Sand & Material Company, Ltd.,
17 Welland, Ont.

Any concerns or individuals in building and construction business who desire to tender for contracts to architects, builders and owners write or enclose business card to Advertiser, who will introduce a profitable proposition. This particularly applies to new firms and those seeking [illegible] Box 769, Contract Record, [illegible] 17-20

DO YOU NEED HELP?

If so let us know. We can furnish any amount of skilled and unskilled labor at shortest notice.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
[illegible] 2919 14-17

Situations Wanted

[illegible] life's experience on Railway, Dock and Harbor Work. Highest references. Box 764, Contract [illegible] 15-17

Situations Vacant

First class construction foreman, capable of [illegible] preferred.

[illegible]
16-17

WANTED Superintendent of construction to take complete charge of one million dollar office [illegible] 17

Wanted

[illegible] 16 17

Wanted

Resident Sales Manager to sell Provincial [illegible] and power line, also with town and city authori[illegible] poles are largely used for ornamental [illegible]. No competition. Endorsed by [illegible] engineers. No previous experience [illegible] this special line. Write stating pre[illegible] Contract Record & Engineering Review, Toronto, Ont. Replies will [illegible] 16 17

Business Buildings and Industrial Plants

(Continued from page 67)

Mason, W. H. Yeates, 24 Leeming St. Carpenter, H. McCullough, 545 Main St. E. Three storeys, brick and structural steel construction, cement foundation, felt and gravel roofing.

Bank building, King E., for Bank of Nova Scotia, Head Office, Toronto. General contractors, Harris & Harris, Confederation Life Bldg., Toronto. One storey, stone and cement foundation, structural steel, reinforced concrete and brick construction.

Montreal, Que.

Warehouse, cost $26,300. Owner and builder, Canadian Bronze Co., Delorimier. One storey, 97 x 100. Foundations in.

Ottawa, Ont.

Work shops, cost $4,000, for Trudel & McAdam, 309 Sparks street. General contractor, Geo. Crain, Clemow ave. Fittings and equipment for blacksmith shop required. Cement foundation, solid brick construction.

Business building, cost $190,000, Queen street, for Ottawa Evening Journal, Elgin street. Manager, P. D. Ross. Architect, A. LeB. Weeks, 75 Sparks St. General contractors, Shuttleworth & Black, 24 Euclid ave. Sub-contracts not awarded yet. Seven storeys, 56 x 90.

Store and residence, cost $6,000, Gloucester, for Clarence H. Lewis, 367 Nepean street. General contractors, Geo. H. Wilson, 572 MacLaren. Brick veneer construction, cement foundation.

Regina, Sask.

Departmental store, cost $500,000, for C. W. Sherwood Co., Ltd. Architects, Brown & Vallance, Montreal and Regina. General contractors, R. S. Lecky & Co. Four storeys and basement, 150 x 170.

Sackville, N.S.

Stores and apartments, cost $10,000, Bridge street, for C. W. Cahill & Fawcett Bros. Builder and general contractor, J. W. Doull. Two storeys, 55 x 70, stone foundation, pressed brick construction. Excavating started.

Toronto, Ont.

Warehouse, cost $41,000, Markham & College, for F. R. Cowan (in trust), 202 Crawford street. General contractor, T. Essery, Avenue Rd. Four storeys, 100 x 112, brick foundation, structural steel and brick construction.

Toronto, Ont.

Coal pocket, cost $8,000, Greenwood ave., for Standard Fuel Co., King St. E. Architect, Adolphe Suck, Hyde Park, Mass. General contractors, Harris & Harris, Confederation Life Bldg., Toronto. Cement foundation, reinforced concrete construction.

Addition to warehouse, cost $20,000, Richmond and Duncan, for Imperial Clothing Co., 217 Richmond W. Architect, I. Feldman, 199 Yonge street. Mason, S. Goldstein, 25 Kensington ave. Carpenter, J. Hogg, 540 Adelaide St. W. Four storeys, Foundations started.

Office building, cost $6,000, Bloor St. Owner and builder, J. M. Lyle, 14 Leader Lane. Two storeys, 35 x 55, brick foundation, structural steel and brick construction. Plans drawn.

Vancouver, B.C.

Office building, cost $600,000, Richards and Hastings streets, for J. W. Weart, 837 Hastings street west. Architects, Russell, Babcock & Rice, 837 Hastings St. W. Concrete work, The Canadian Ferro Concrete Co., 951 Cordova E. Elevators, The Canadian Van Emon Elevator Co., 207 Hastings Street West. Steel work, J. Coughlan & Sons, 142 Hastings St. W. Fifteen storeys, structural steel construction, pressed brick and terra cotta faced. Architects are sub-letting contracts. Old buildings were razed.

Warehouse & dock, Smythe street, for A. J. Forsyth & Co., 325 Howe street. Architect, T. H. Bamforth, 319 W Pender street. General contractor, H. Peterson, 1905 Quebec street. Wharf, 55 x 225, warehouse, 55 x 75, frame construction, corrugated iron roofing. Train tracks to run through centre of building.

Residences

Edmonton, Alta.

J. E. Duggan, c/o Albert Hotel, will erect modern apartment house. Plans in progress.

London, Ont.

Residence, cost $6,000, for Jas. E. Kerrigan, Craig and Ridout street. Two storeys, stone and cement foundation, pressed brick construction. Plans in progress.

Residence and garage, cost $8,000, for Frank E. Harley. Architect, Alvin E. Harley, 304 Bowles Bldg., Detroit, Mich. Tenders are now being received by owner. Three storeys and basement, 28 x 36 and 24 x 30, pressed brick, Bedford stone, structural iron construction.

Montreal, Que.

Residence, cost $10,000, Decelles, for Alf. Girard, 1217 Cote des Neiges Rd. 2½ storeys, 80 x 50. Plans drawn.

Residence, cost $5,000, Carrieres, for Isaie Denis, 1451 Papineau. Two stys.,

For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where "the breezy call of incense breathing morn" will put new life in mind and body. Muskoka offers more real healthful enjoyment for less money than any other resort in the world.

Four cottages to rent $125 to $200 on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box 771,

Canada Lumberman, Toronto Ont.

FOR SALE

Steam Shovel, Locomotives and Dump Cars

1 "Marion" Steam Shovel, Model 50; Shop No. 2131: new in 1910; only handled about one hundred thousand yards.
2 Portable Locomotives, narrow gauge, 10" x 16"; saddle-tank in excellent condition.
14 "Allison" Dump Cars; narrow gauge; one-way; 4-yd.

All or any part of the above equipment ready for instant delivery; now in Montreal. Address:

Canadian Stewart Co., Ltd., Eastern Townships Bank Building **Montreal, Canada**

For Permanent Roads and Streets

For road preservation, Trinidad Liquid Asphalt applied hot or cold forms a protective coating. It has all the stability of the famous lake asphalt, of which it is a primary form.

Trinidad Liquid Asphalt

should not be confused with ephemeral dust preventatives. Such products must be constantly applied to replace what quickly disappears from the road. Trinidad Liquid Asphalt **stays in the road** and builds up a lasting asphaltic surface.

Bermudez Road Asphalt is the only **Lake** asphalt macadam binder for permanent construction. It does not "bleed," volatilize or coke and allow the macadam to go to pieces.

Bermudez Road Asphalt

"It stays put" because nature has exhausted her destructive influences upon it **before** it goes into roads. Perfectly adapted to city boulevards, park drives, private roads and town streets, as well as to country roads.

For smooth, durable streets, consider the advantages of Trinidad Lake Asphalt. With this material 172,500,000 square yards of pavement have been constructed. Notwithstanding the fact that

Trinidad Lake Asphalt

is the "world's standard for the best pavement," a Trinidad lake asphalt pavement can now be constructed at less cost than stone, wood, or other pavement of anything like the advantages of sheet asphalt.

For Booklets and other Information address

The Barber Asphalt Paving Company

PHILADELPHIA, PENN.
Offices in Principal Cities

[illegible] x [illegible] felt and gravel roofing. Plans drawn.

Three flats, cost $4,000, for J. Pet-[illegible] [illegible] St. [illegible]. Three storeys, 24 x [illegible]. Plans drawn.

Residence, cost $5,000, Pine ave., for N. J. Davies, 617 St. Paul. Three stys., [illegible] x [illegible]. Plans drawn.

Ottawa, Ont.

[illegible] cost $6,000, Driveway Reserve, for W. H. Walker, 482 Cooper St. Architect, W. Herbert George, Castle Bldg., Queen street. Carpenter, C. Nichols, 589 McLeod street. Other contracts are not awarded yet. Stone foundation, brick construction.

Toronto, Ont.

One detached residence, cost $5,800, High Park ave., for D. W. Hall, 1739 Dundas street. Architect, P. R. Wright, 332 Clendenan ave. 2½ storeys, 24 x 36, brick construction and foundation. Plans drawn.

Residence, cost $3,000, for Murray Watt, 31 Winchester street. Architect, A. E. Watson, 14 Leader Lane. 2½ storeys, 24 x 36, brick construction and foundation. Plans drawn.

Residence, cost $6,000, Montclair, for C. P. Godden, 154 King E. Architect, J. H. Stanford, Bloor and Ossington. 2½ storeys, 34 x 38, stone and brick foundation, structural steel and brick construction. Plans drawn.

One detached residence, cost $3,500, Ferndale ave., for W. G. Smith, 117 Delaware ave. Architect, T. Hancock, 836 Dovercourt road. 2½ storeys, 23 x 32, brick construction and foundation. Plans drawn.

One detached residence, cost $5,500, Exeter ave., for W. J. Irwin, c/o The Globe, Yonge street. Architect, C. W. Hurndall, 10 Munro Park ave. Two storeys, 22 x 36, brick construction and foundation. Plans drawn.

One detached residence, cost $8,500, Westmount, for T. J. Sproule, 54 Shanly. Architect, W. G. Hunt, 990 Bloor west. Two storeys, 25 x 51, brick construction, stone foundation. Plans drawn.

Apartments, cost $10,000, Quebec ave., for E. P. Atkinson, Standard Bank, Dundas and Quebec. Architect, J. H. Galloway, 23 Toronto street. Two storeys, 30 x 66, brick foundation, brick and structural steel construction. Plans drawn.

Apartments, cost $8,000, Dorval, for G. W. Boake, Brunswick & Bridgeman. Architect, E. H. Yeigh, 410 Kent Bldg. Two storeys, 29 x 41, brick construction and foundation. Plans drawn.

Winnipeg, Man.

Residence, cost $5,000, Machray, for A. Nordgren, 326 Bannerman. 2½ stys., 30 x 24, brick, stone foundation. Plans drawn.

Hamilton, Ont.

Residence, cost $7,000, York street, for Wm. Langhorn, Brunswick Hotel. Architects, Munroe & Mead, Chancery Chambers. 2½ storeys, 34 x 40, pressed brick construction, stone foundation. Tenders received by architect.

Montreal, Que.

Detached residence, cost $20,000, Westmount, Roslyn ave, for Mrs. E. J. Holland, 74a Bloomfield street. Plans drawn.

Detached residence, cost $11,000, for Alf. Morin, 4078 St. Antoine street. Stone trimmings, pressed brick construction. Plans drawn.

Two pair detached residences, cost $30,000, for Mr. I. Collins, 207 Ash ave. Brick construction. Plans drawn.

Toronto, Ont.

Two detached residences, cost $6,000, for G. H. McLaughlin, 54 Hogarth ave. Architect, P. H. Finney, 79 Adelaide E. 2½ storeys, 24 x 40, brick construction and foundation. Plans drawn.

One detached residence, cost $5,500, Whitney, for William Smart, 649 Shaw street. Architect, J. Hunt Stanford, Bloor and Ossington. 2½ storeys, 30 x 40, brick construction and foundation. Plans drawn.

Winnipeg, Man.

Residence, cost $15,000, for H. N. Herchenson, c/o West End Realty & Bldg. Co., cor. Lenore street and Portage ave. To be erected on corner of Westminster and Ethelbert. Plans in progress.

CONTRACTS AWARDED

Calgary, Alta.

Residence, cost $5,000, Sunalta. Architects and general contractors, Alberta Home Builders, 201 Grain Exchange. One storey, 32 x 40, frame construction, cement foundation. Excavating done.

Residence, cost $5,000, Mount Royal, for G. Zimmerman, Solicitor. Builder, J. N. Henderson, Beveridge Block. General contractors, McDougal & Foster, Board of Trade Bldg. One storey, 60 x 30, brick and frame construction, cement foundation. Two built-in fireplaces.

Edmonton, Alta.

Residence, cost $5,000, for Mrs. C. A. Briggs. Architect and general contractor, Geo. Lang. Two storeys, 27 x 32, frame, brick foundation. Excavating started.

Residence, cost $5,000, Second street, Architect and general contractor, E. Liemon, 35 Saskatchewan ave. Two storeys, 26 x 34, frame, brick foundation. Excavating started.

Two residences, cost $9,000. Architect and general contractor, E. W. Organ, 424 Muttart Block. Two storeys, 24 x 30 each, frame, concrete foundation. Excavating started.

Hamilton, Ont.

Residence, cost $5,000, Spadina ave. Architect and general contractor, B. H. Prack, 36 James St. S. 2½ storeys, pressed brick construction, stone foundation.

Residence, cost $6,200, Beulah ave. for William O'Connor, 63 Dundurn St. General contractor, R. Spicer, 324 Herkimer street. Stone foundation, brick construction.

Apartment house, cost $7,000, Duke street, for E. S. Elms, 153 Caroline St. S. General contractor, A. Elms, 153 Caroline St. S. Concrete foundation. Permit granted.

Montreal, Que.

Twelve flats, cost $10,000, Esplanade. Owner and builder, O. Dansereau, 2547 Park ave. Three storeys, 75 x 65; felt and gravel roofing. Excavating started.

Six flats, cost $7,000, Montana. Owner and builder, O. Carrier, 123a Amherst. Three storeys, 48 x 45. Excavating started.

Two residences and one store, cost $12,000. Owner and builder, D. Handfield, 2161 St. Urbain. Three storeys, 50 x 38, stone foundation. Excavating started.

Ottawa, Ont.

Two residences, cost $10,000, Hopewell. Owner and general contractor, Samuel J. Lucy, 40 Glenn ave. Brick veneer construction. Foundations in.

Residence, cost $15,000, Laurier East. Owner, Dr. F. W. C. Mohr, 260 Laurier Ave. E. Architect, C. P. Meredith, 126 Sparks street. General contractor, S. R. Rudd, Arnprior, Ont. Cement foundation, Indiana stone construction.

Alterations and additions to apartments, cost $15,000, Clarence, for J. Eagleson, Cooper street. Architect, J. P. MacLaren, 104 Sparks street. Mason, Alex. Garvock, 136 Lewis. Carpenter, Geo. Holman. Painting, J. H. Baron, 420 Gladstone. Electrical work, P. Ackroyd, 184 Bank street. Plasterer, Murphy & Morrow, Bronson ave. Solid brick construction, cement foundation.

Pembroke, Ont.

Residence, cost $7,000, for Geo. Burns, Architects, Morris & Moore, Pembroke St. General contractors, Kehoe Bros. 2½ storeys, 29 x 50, brick veneer construction, stone foundation.

Port Arthur, Ont.

Residence, cost $5,500, Argyle, for A. E. Gurney, c/o I. L. Matthews & Co. Architect and builder, W. T. Crouch, 217 Arthur street. Two storeys, 26 x 28, brick veneer and shingle construction, sandstone sills, cement foundation.

Residence, cost $4,500, for W. E. Mutch. Architect and builder, W. T. Crouch, 217 Arthur street. Two storeys, 24 x 30, brick veneer and shingle construction, sandstone sills, cement foundation.

Quebec, Que.

Residence, cost $8,000, for A. Beriau, Cartier & Lafrance aves. Builder and general contractor, E. Pelletier, c/o owner. Iron and steel, L. H. Gaudry & Co., 76 St. Pierre. Roofing, N. Barbeau, 36 Bridge. Painting, J. Gauthier & Frereir, 292 St. Joseph. Heating, plumbing and electrical work, O. Picard & Fils, 199 St. John. Four storeys, 80 x 60, stone foundation, Scotch brick and structural steel construction.

Toronto, Ont.

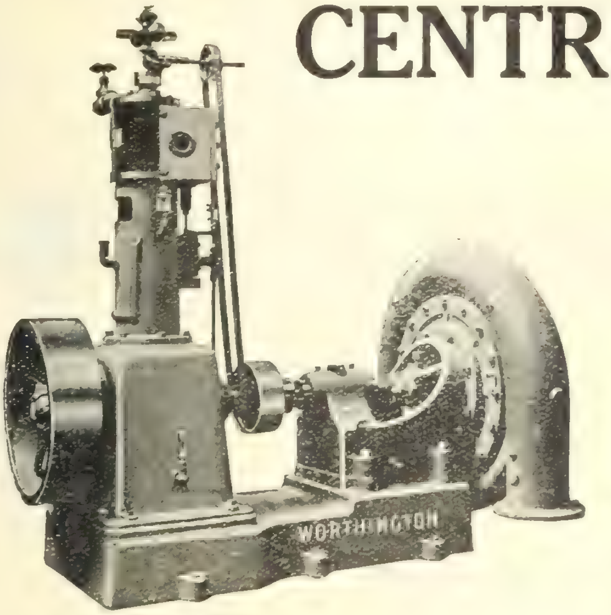
Two family apartment, cost $6,000, for Mrs. W. J. Kenmure, Franklin Apts. Builders, Knechtel & Molson, 389 Keele street. Two storeys, 24 x 51, stone and brick foundation, structural steel and brick construction.

Forty-two residences, cost $6,000 to $9,000 each, Carey Rd. and Belsize Drive General contractors, Sharp Construction Co., 43 Adelaide St. E. 2 and 2½ storeys. Excavating started.

One detached residence, cost $5,500, for W. J. Foster, 112 Beatrice street. Builder, Arthur A. Hobson, 70 Hilton. 2½ storeys, 23 x 36, brick construction, stone foundation.

Winnipeg, Man.

Residence, cost $17,000, Central ave., for A. Long, c/o builder and architect, W. J. Davidson, 127 Canora street. 2½ storeys, 38 x 40, brick veneer construction. Excavating done.



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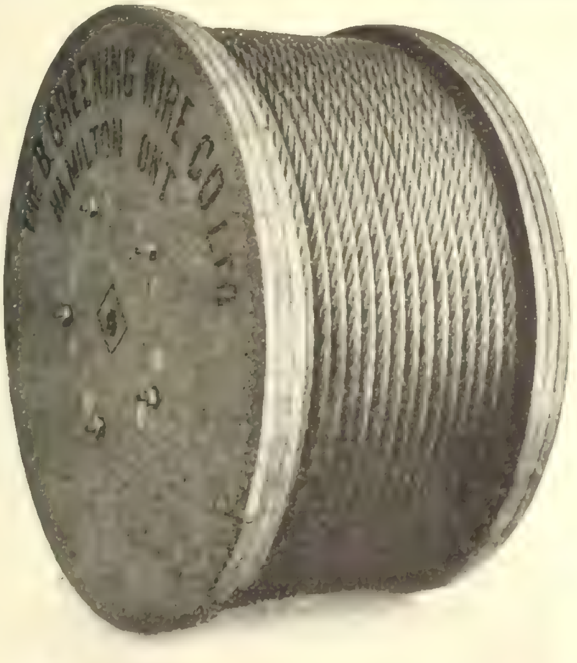

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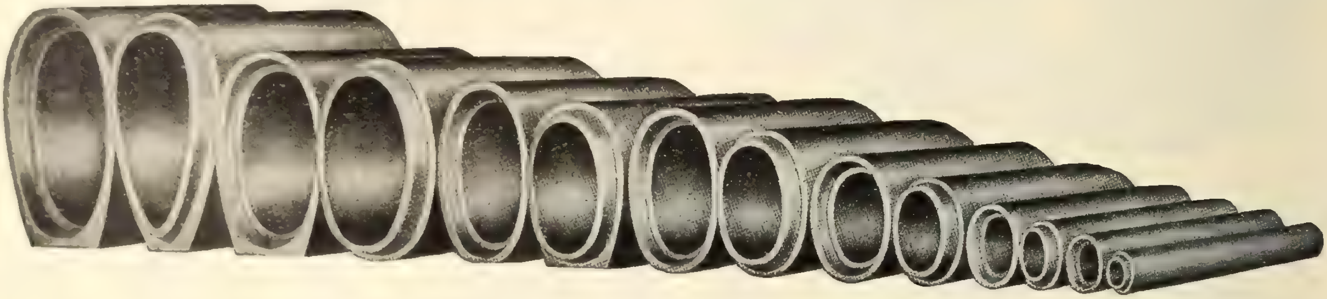

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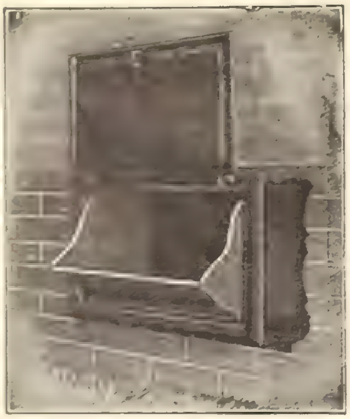

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with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

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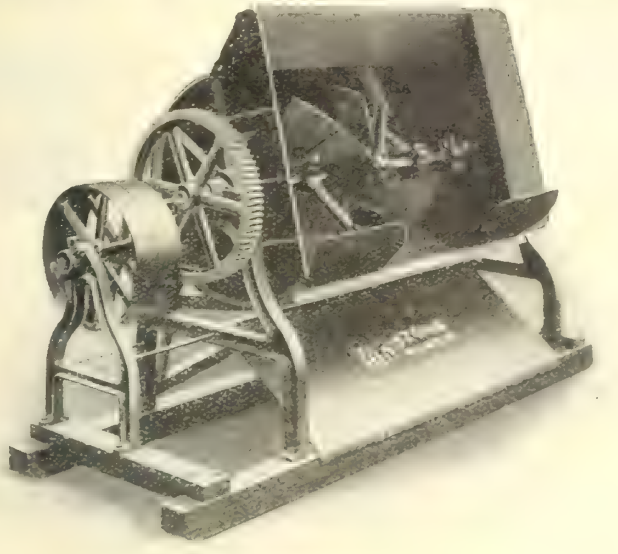

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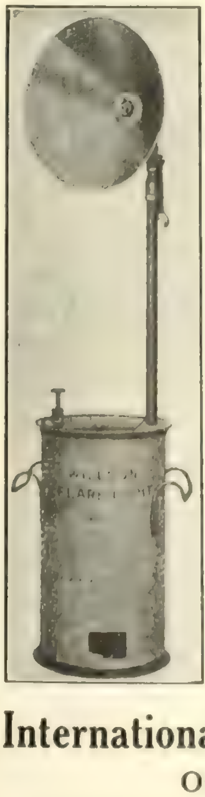

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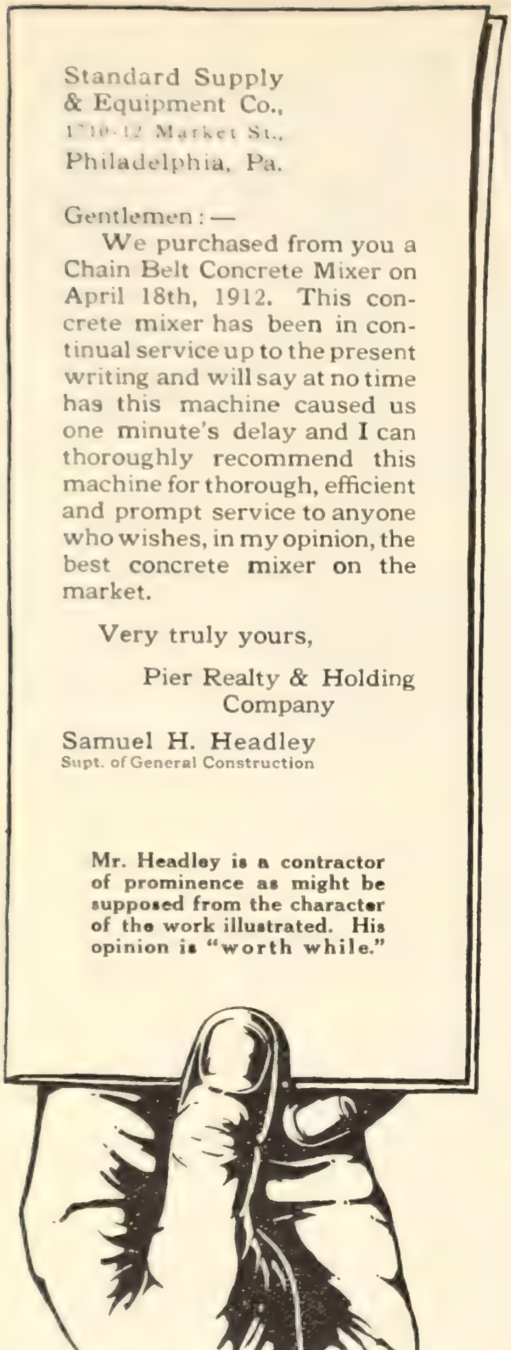

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THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

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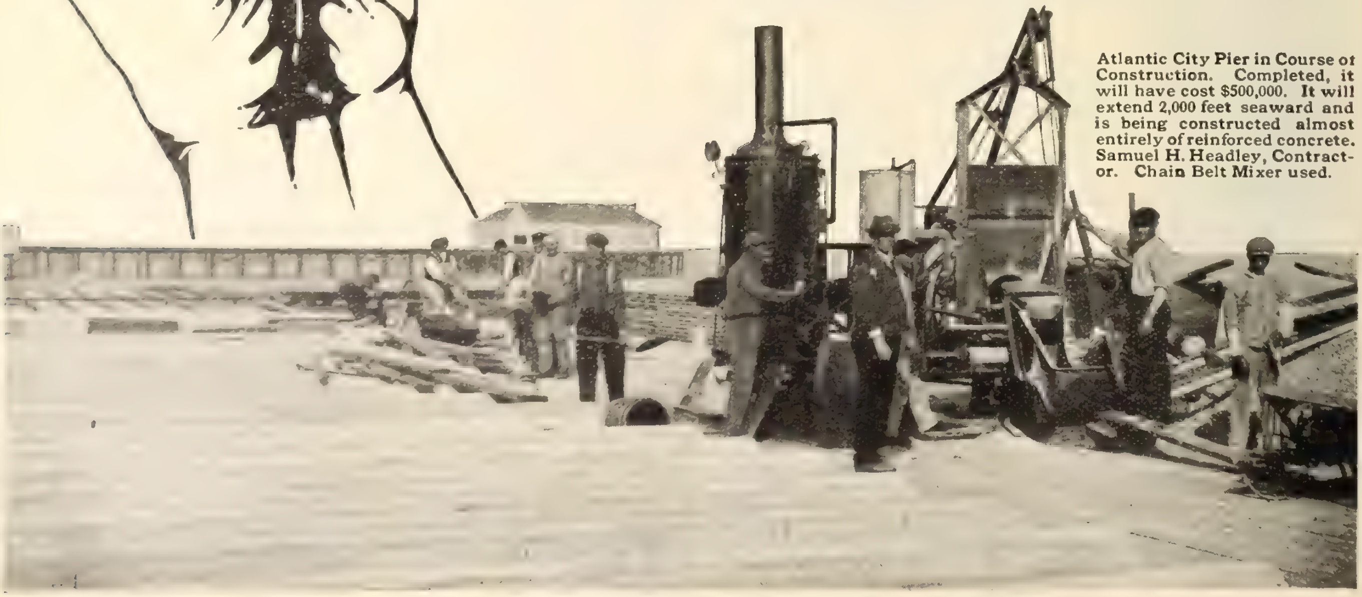

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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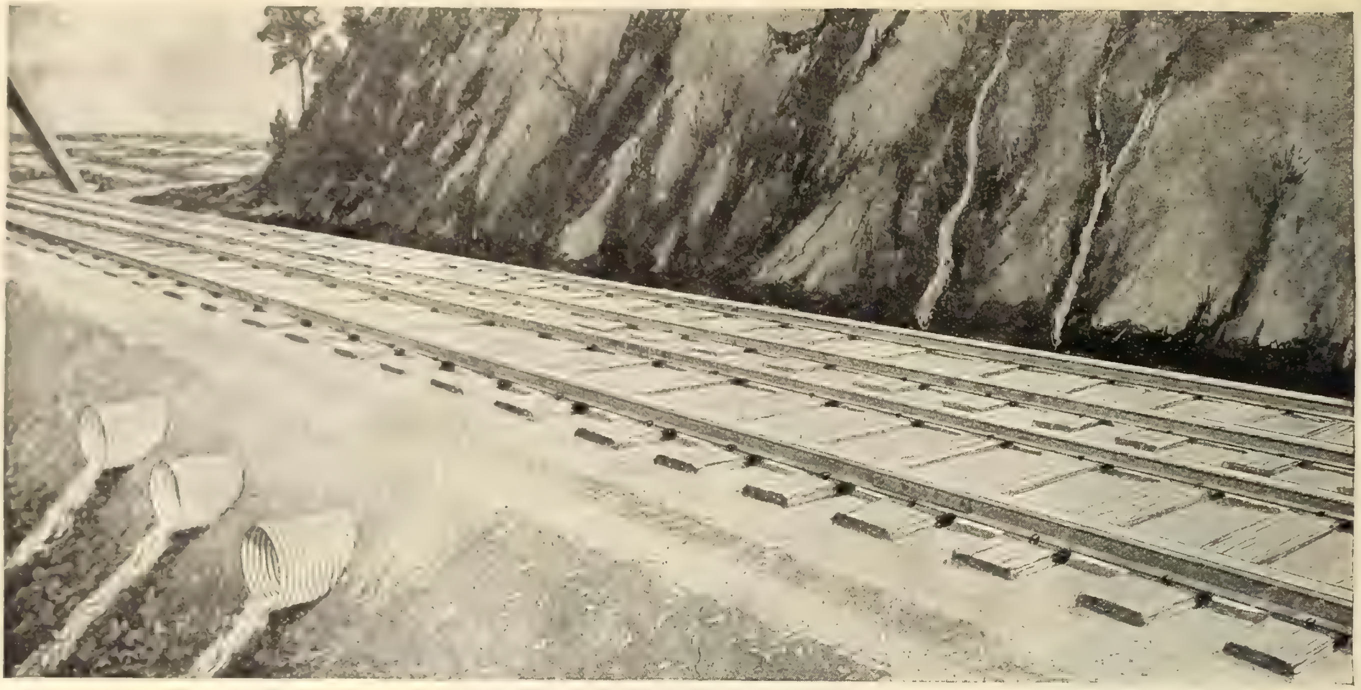

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The CAUSE of CORROSION

Oxidation is a self-protecting process, and corrosion of this type on iron results in a bright orange deposit. Electrolysis is the prime factor in dangerous corrosion, and is characterized in iron by a dark red scale, continuously produced until the metal falls apart.

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TONCAN METAL

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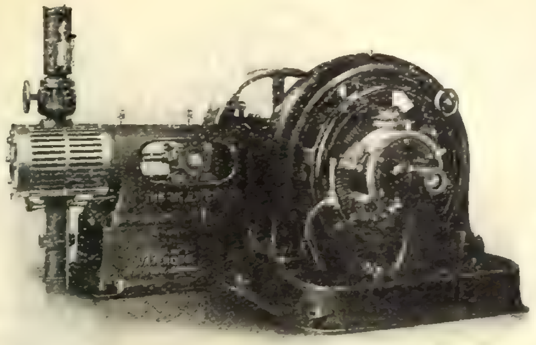

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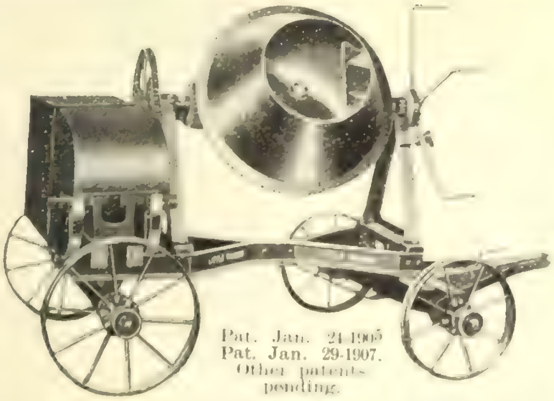

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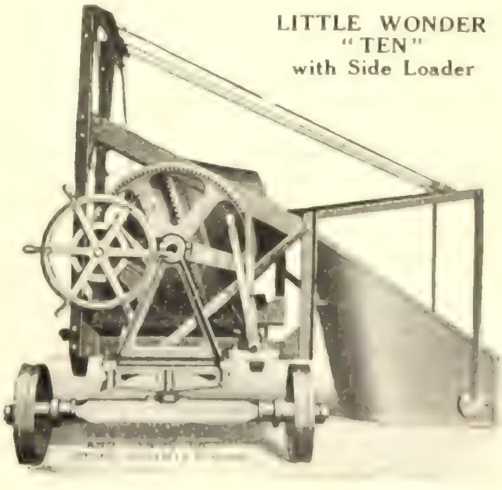

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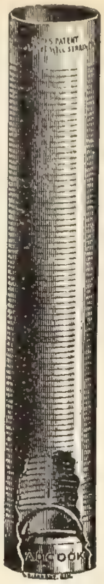

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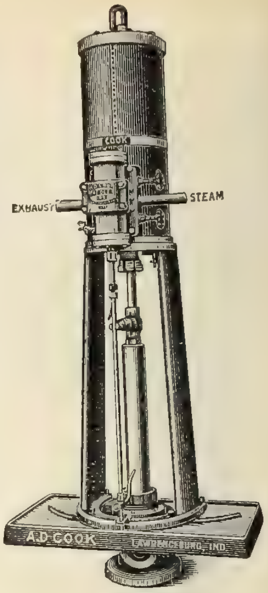

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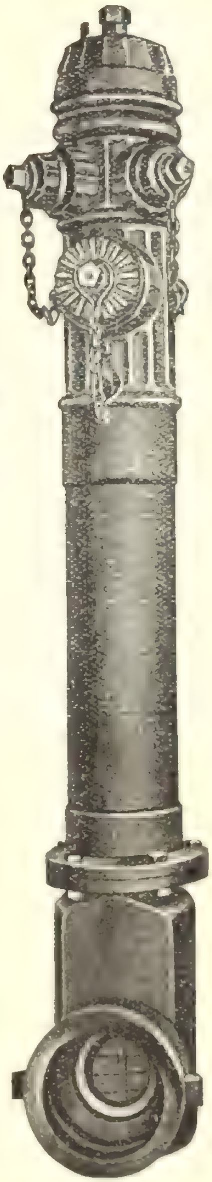

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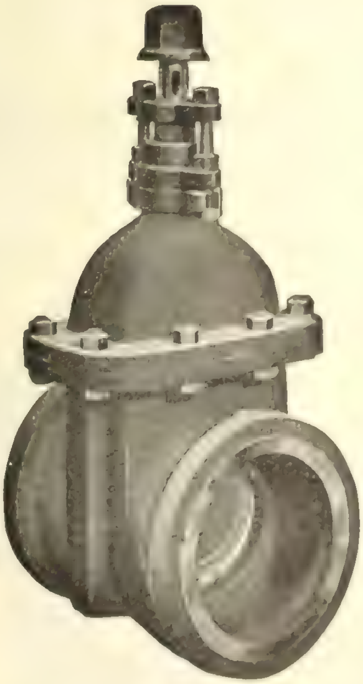

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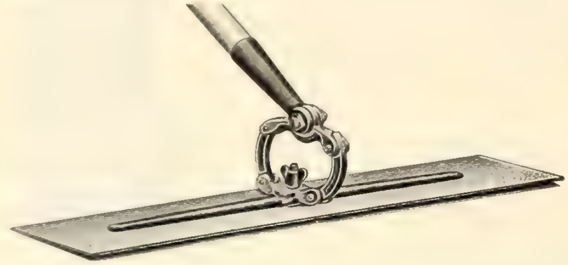

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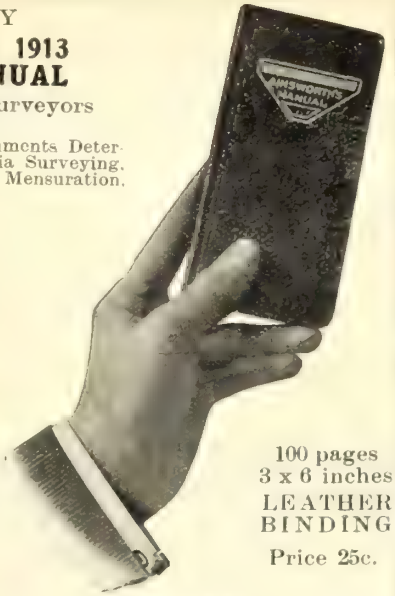

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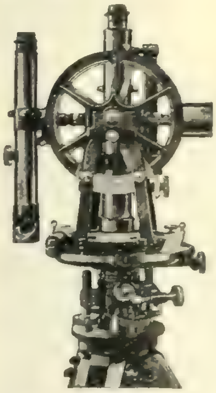

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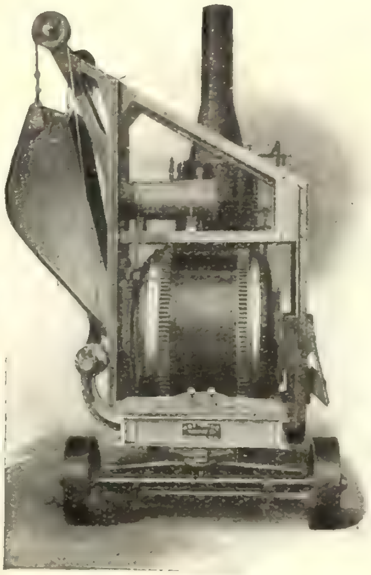

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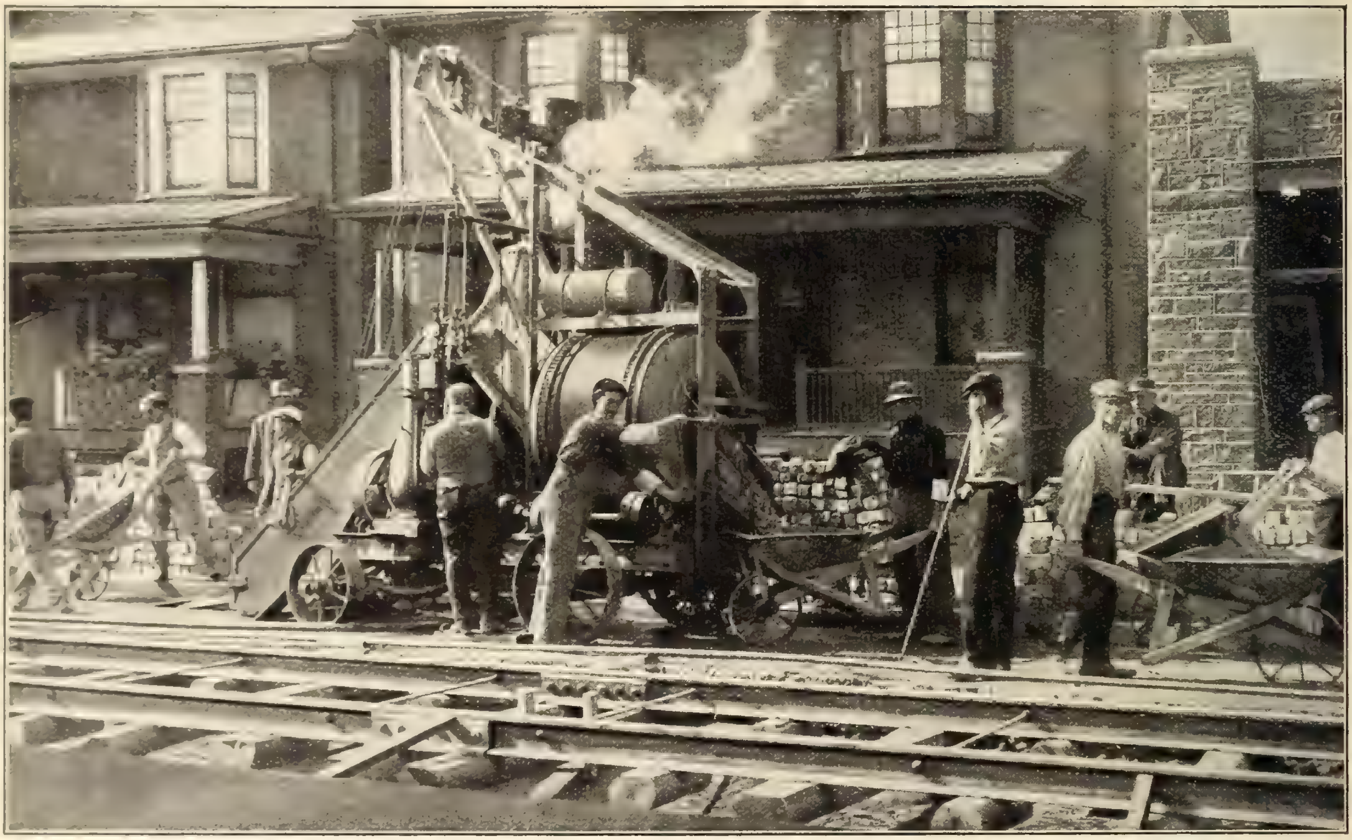

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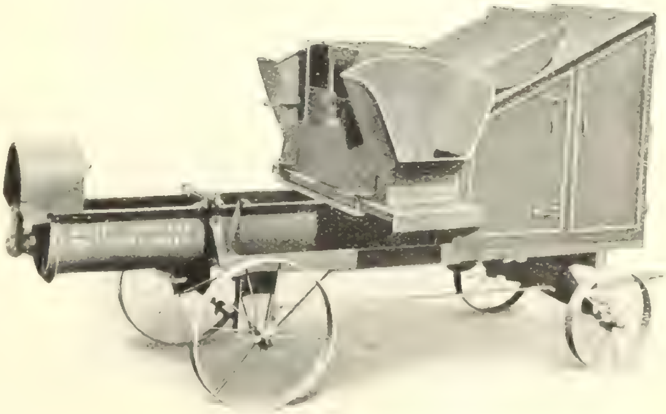

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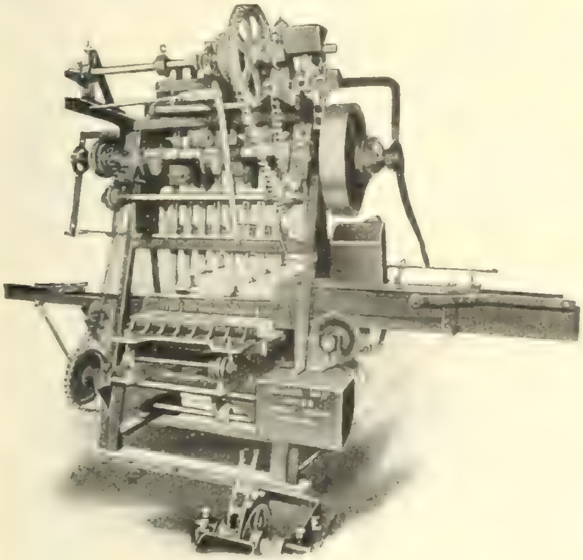

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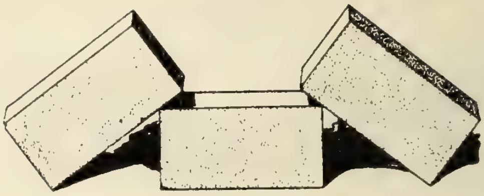

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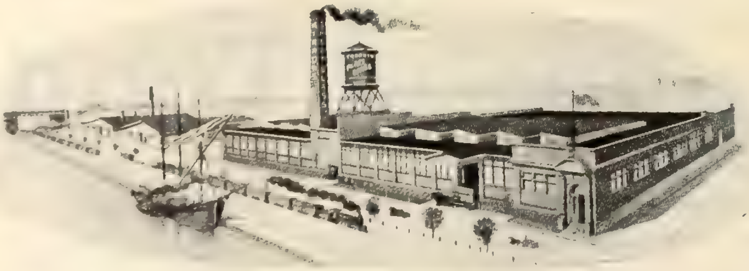

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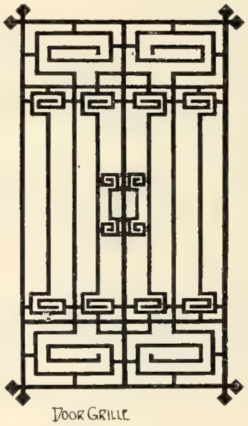

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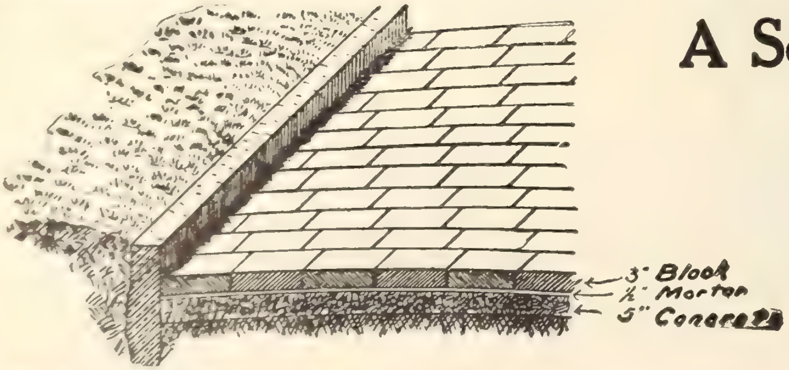

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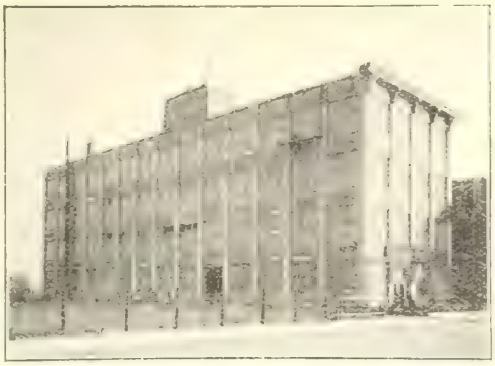

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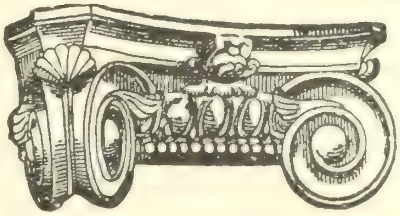

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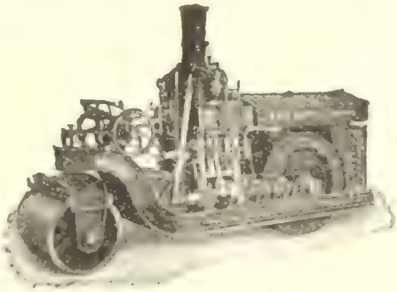

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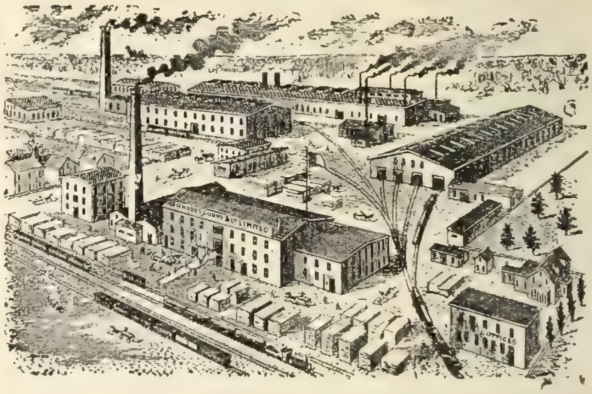

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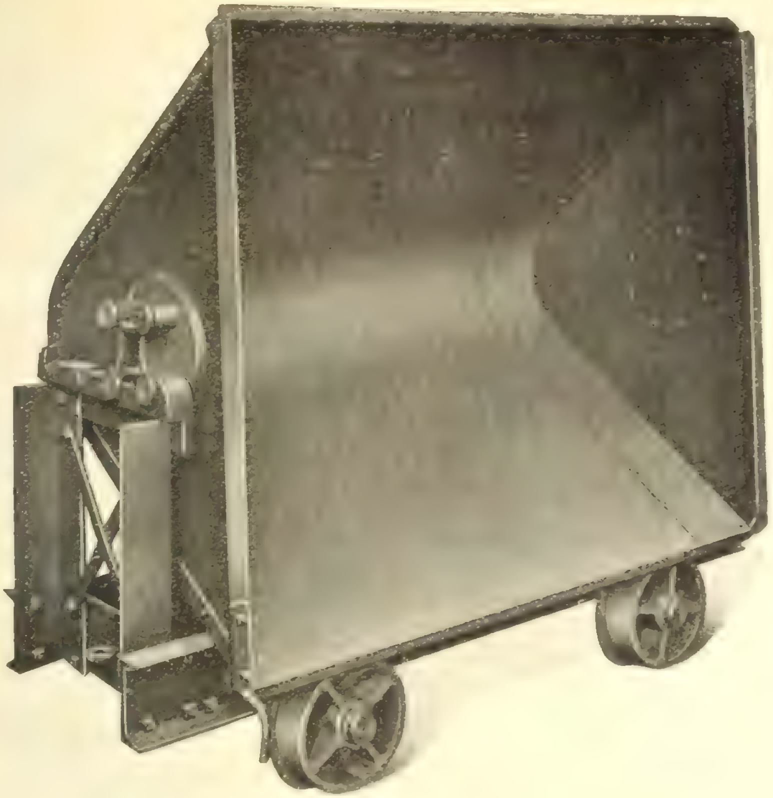

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If you are intending to purchase **Steelwork** for any purpose, it will be to **your interest** to permit us to quote.

Sarnia Bridge Company Limited

SARNIA - CANADA

WE ARE MANUFACTURERS OF

Structural Steel of All Kinds

Railway and Highway Bridges
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Beams, Channels, Angles, Plates, etc., in stock

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WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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Wm. P. McNeil & Co.

Limited

New Glasgow — Nova Scotia

STEEL MERCHANTS
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Steel Railway and Highway Bridges, Steel Frame and Mill Buildings, Structural Steel and Plate Work of any description.

Capacity 9000 tons per annum.

Shop is equipped with High Speed Electric Cranes and Modern Heavy Duty Tools, Can handle single pieces structural work of 40 tons.

Large Stock of Beams, Channels, Angles, Tees, Plates, etc., for prompt shipment.

Stock yard runway 800-ft. long, crane 70-ft. span.

Shipping runway 400-feet long, crane 80-ft. span.

Delivery yard runway 120-teet long, cranes 40-ft. span.

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Spadina Avenue Dock
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Water Washed Sand
Pit Sand
Screened Gravel
Pit Run
Crushed Limestone
Crushed Granite

OUR plants at AYR and TORONTO are the most modern in the country and our materials are the best that can be produced.

Call Adel. 1947 and we will be pleased to give you all information regarding prices and deliveries.

JAMES THOMSON, President. J. G. ALLAN Vice-President. JAMES A. THOMSON, Secretary.

THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.

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Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

CAST IRON PIPE

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

HAMILTON, ONT.

The Canada Iron Corporation, Limited

CAST IRON PIPE

Head Office:
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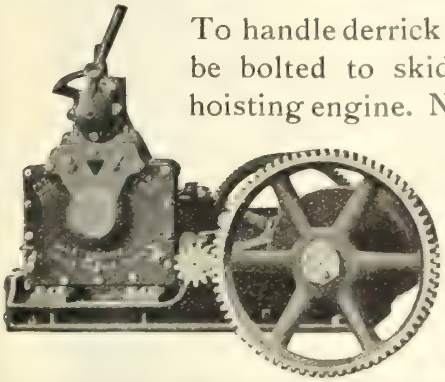
MONTREAL

Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear



To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.

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When you want stone that appeals specify

"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
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The Ready Mixed
Hard Wall Plaster

Manufactured by
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42 Craig Street West, MONTREAL

We are in the market to bid on your plans for granite on buildings.

Our up-to-date cutting plant, excellent quarries and good shipping facilities enable us to make close prices.

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Stained with Cabot's Waterproof Cement Stains
Dudley S. Van Antwerp, Architect, Montclair, N. J.

Cabot's Waterproof Cement Stains

Artistic Coloring and Thorough Waterproofing in One Operation

They give the same soft, artistic coloring effects as the celebrated Cabot's Shingle stains and at the same time make all exterior cement surfaces ***completely*** and ***permanently*** rainproof. They sink into the pores and form no coating over the surface, and therefore do not cover and spoil the natural texture of the cement and cannot crack or peel off. Low cost, easy to apply, and the only artistic colorings for cement.

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Clean, Thorough, Economical and Sanitary

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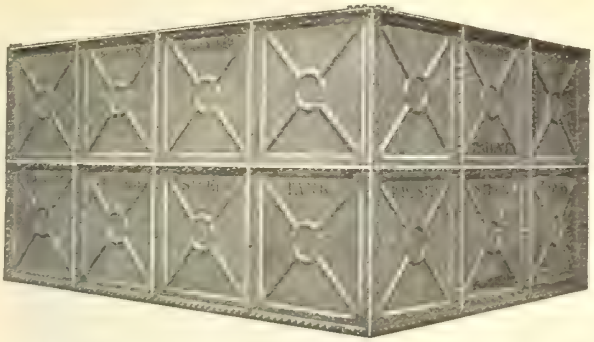
Tiffin Wagon Co., Tiffin, Ohio

Manufacturers of—Wagons, Dump Wagons, Sprinklers, Flushing Machines, Motor Trucks and all Municipal Vehicles.



Made in any length or width in multiples of 4-ft. by 8-ft. or 12-ft. deep.

Patent Pressed Steel Tanks

are built up of plates 4 ft. square by 5/16th in. thick. There are only three types of plates and all are interchangeable. Easily erected by unskilled labor.

LIGHT. STRONG. CHEAP. UNBREAKABLE.

IMMEDIATE DELIVERY FROM STOCK.

STEEL PIPES Welded or Rivetted

of any diameter over 12 inches and having any desired type of joint.

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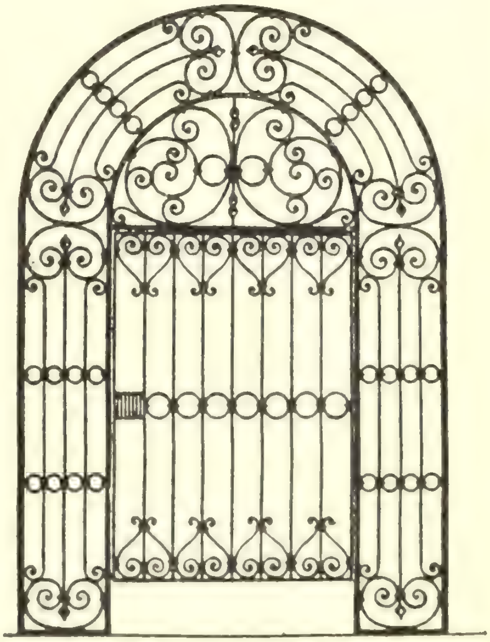

"Bull Frog" Wheelbarrows and Concrete Carts of all descriptions

Are you satisfied with your wheelbarrows, if not you can purchase the "Bull Frog" brand from Dominion Equipment & Supply Co. of Winnipeg, London Concrete Machinery Co., Ltd., London, Ont. and E. P. Jamison & Co., Ltd., of Vancouver, and be assured of satisfaction.

THE TOLEDO WHEELBARROW COMPANY, TOLEDO, O., U.S.A.

Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Sand Stock Bricks	13 00
Wire cut bricks for foundation work	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	27 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving	36 00	40 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	27 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8 in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles

XXX B. C. Clear Shingles, per M.	3 75
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	25
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
85	5 30	8 25
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent.; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock .... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 60 per cent.

Lead Pipe

Lead pipe, $7.50 net, less 10 per cent.; lead waste, $9.00 net, less 10 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 30 per cent.; pig lead, 6½c. lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.04	¼ inch	$2.86
⅜ "	2.04	⅜ "	2.86
½ "	2.72	½ "	3.57
¾ "	3.16	¾ "	4.31
1 "	4.54	1 "	6.19
1¼ "	6.19	1¼ "	8.44
1½ "	7.43	1½ "	10.13
2 "	9.90	2 "	13.50
2½ "	15.80	2½ "	21.56
3 "	20.75	3 "	28.31

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¼ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a yard, f.o.b. Toronto siding.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 61c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 58c. per gal. of 9 lbs.

Turpentine, in barrels, 66c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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The WEEKLY FINANCIAL, COMMERCIAL & GENERAL TRADE NEWSPAPER of the GREAT WEST,
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Contracts taken in any part of Canada. Several years' experience in Artesian Wells for Municipal Water Works. Estimates or geological information cheerfully furnished. **References Given.**

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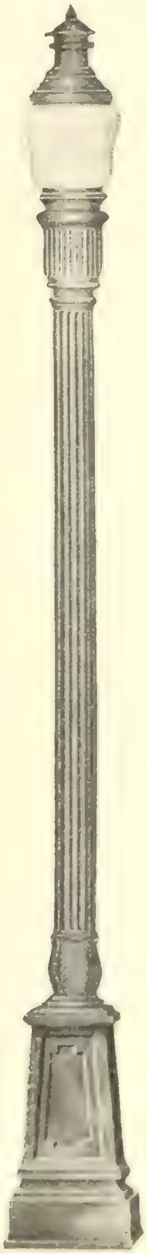

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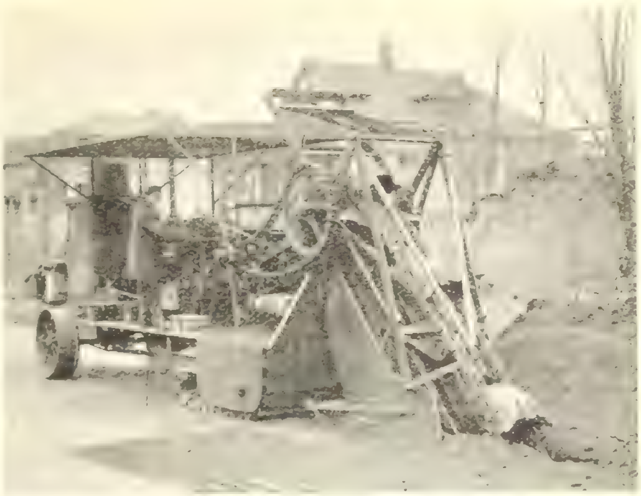

Three Lineal Feet per Minute of 40-in. Trench 18 ft. Deep in Hard Clay

This is the record of an Austin Trench Excavator working at Edmonton, Alberta, and the owner makes signed statement as follows:

> "The work positively shows that there is no other machine on the market capable of moving that amount of material of the same class at this rate of speed."

Another

Austin Trench Excavator

working on sewer trench at Walla Walla, Washington, dug cemented gravel "like solid rock and we were allowed solid rock prices for it"—this also is a signed statement.

Austin Trench Excavators

have the following features: All-steel construction—Sraight beam excavator arm—Single chain drive—Manganese steel pins, bushings and working parts—Self-cleaning buckets—Multipedal non-miring tractions—Adjustable spoil conveyors—A record of continuous work and low-upkeep cost which challenges comparison.

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Represented in Western Canada by The Canadian Equipment & Supply Co., Calgary; E. G. Cullen, Vancouver

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"TAMCO" Crushed Stone in all sizes, for all purposes.
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Sanitary flooring, stone crushers, fire engines, &c.
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Toronto, Canada

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The first Creosoted Wood Block Pavement laid in America was on Tremont Street, Boston, Massachusetts, twelve years ago.

This pavement was laid to secure a test of the wearing qualities of Wood Block.

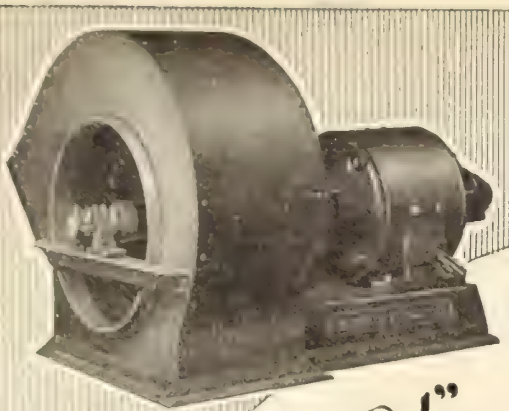
The street was paved, partly with Asphalt of standard construction and partly with Creosoted Wood Block.

The Asphalt was taken up some time ago and street newly paved.

The guarantee has long since expired on the Creosoted Wood Block but the pavement is as good as ever, the surface wear is scarcely apparent, and it will be many years before repairs are necessary.

We have the very best materials and we endeavor to manufacture DOMINION WOOD BLOCKS up to the highest possible standard.

The Dominion Creosoting Co., Ltd.
Vancouver, B. C.



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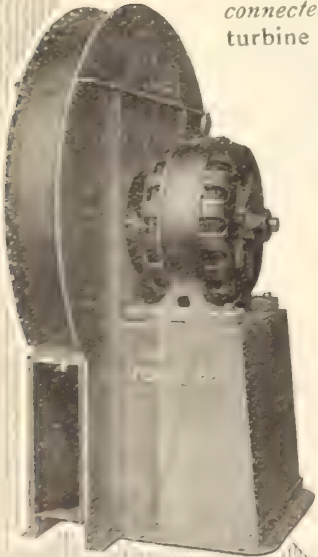
For Heating, Ventilating, Drying and Exhausting.

Ask our engineers to recommend the fan best suited to your requirements. Our designs include the new high-efficiency "*Conoidal*" multiblade fan, used extensively for heating systems, mine and tunnel ventilation, and the motor-driven *Steel Plate Pressure Blower*, giving pressures up to 24 oz. Both of these designs show higher efficiency than obtained with any similar types. We specialize in *direct-connected* units (motor, engine or turbine driven) for every service. These are distinguished by absence of belt troubles and the very lowest power consumption. Whatever your problem write us.



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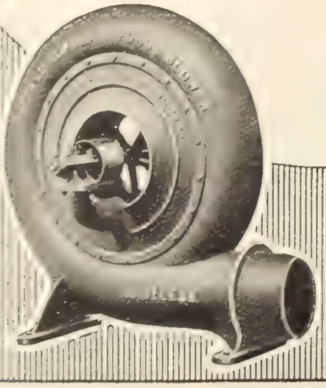

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"The Architect who specifies Dehydratine or Hydratite insures his client against leaky basements and wet foundations."

Symentrex—"King of Cement Coatings"—for concrete floors and all masonry surfaces. In colors and waterproof.

Symentrin—Interior Flat Wall Finish.

"Ferro-Fax"—"The Ferrolithic Method"—for dust-proofing concrete floors and making them traffic resisting.

Requires only 5% (five) by weight of cement to secure results.

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For 15 years standard of their kind

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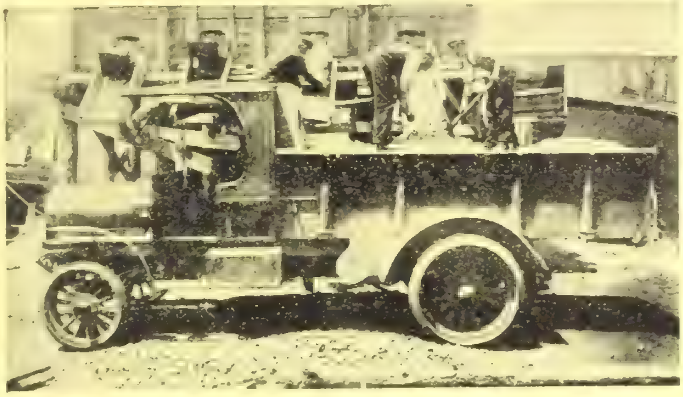
Think of a Truck Saving $43 a Day Over Horses!



A seven-ton Mack Truck doing the work of eight mule teams in the construction of macadam road.

The City of Rutland, Vermont, owns a seven-ton Mack Dumping Truck, of which Mayor Clement writes as follows:—

"We moved on an average of 114 tons a day with this truck at a daily cost of $5. If this same work were done by teams it would require at least 12 teams costing, in this city, $4 each."

As it cost them only $5 a day to operate the Mack Truck this makes a saving of $43 a day over horses, and yet this is nothing extraordinary.

We have records of hundreds of Mack Trucks earning from $30 to $50 per day. Those who are not getting this result have not adjusted their business conditions to fit the motor truck unit.

An investment in motor trucks can be utilized twenty hours per day if desired, can double up in rush seasons, and does not deteriorate or wear out when idle.

The opportunities for utilizing the motor truck in contracting work are many and varied.

Would you like to know what motor trucks have done for other engineers and contractors? We have the data for you.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

10

ADANAC RED CORE RUBBER COVERED WIRES AND CABLES

Are made according to the specifications of the National Board of Fire Underwriters. The conductors are drawn from copper of the highest conductivity and are covered with two thicknesses of thoroughly vulcanized rubber compound of high quality. The wires are braided over insulation and the smooth high finish they receive makes them specially desirable for conduit work.

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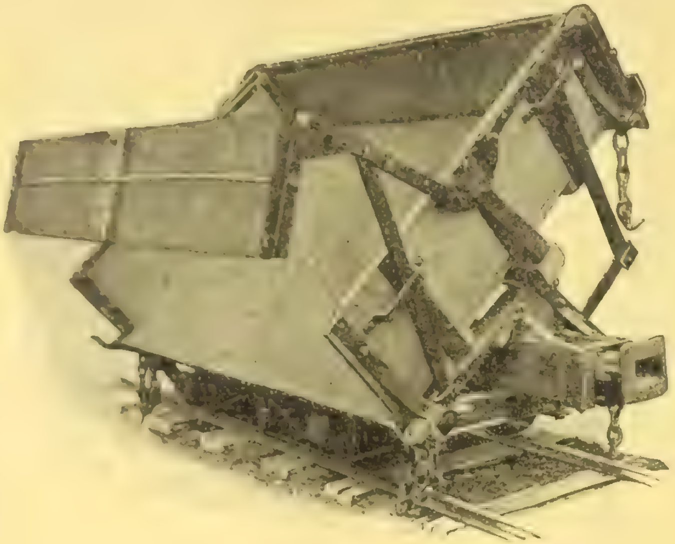

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Dump Cars

Our Dump Cars will give you entire satisfaction. We can supply cars in all capacities for any practical gauge. Wheels are all properly chilled and the construction and material used are the best.
Our Cars are declared by steam shovel and car men to be superior to all others, both in construction and operation.

Let us have your enquiry, we would be pleased to submit full particulars and prices at any time.

"Davenport" Saddle Tank Locomotives

For Contractors and Quarry Service

Supplied in any size for any practical gauge track.

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F. H. Hopkins & Co.

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of all types for any service

A corner of our boiler shop showing several types of plate work in various stages of completion. Our experience of over 50 years enables us to do the best work in the shortest possible time. We make everything from the largest waterworks pumping engines to smallest metal oil tanks. Let us quote on your requirements.

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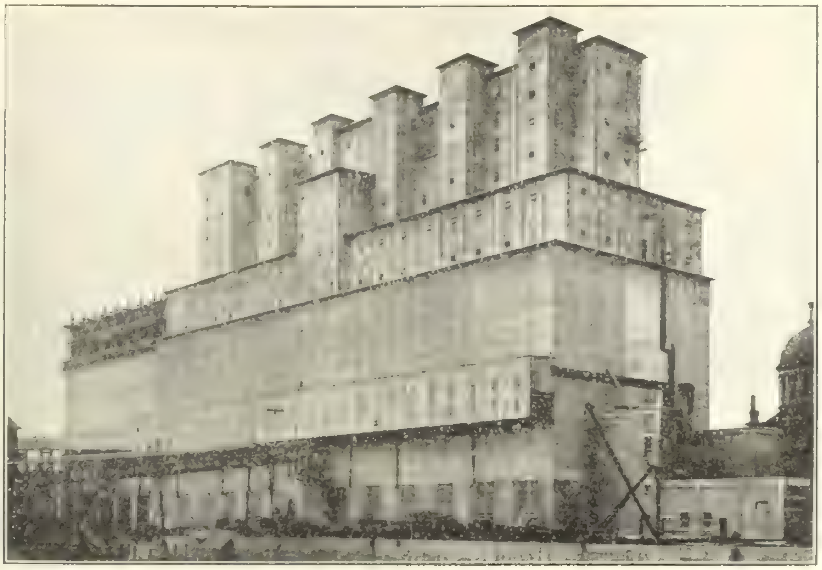

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The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

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Montreal

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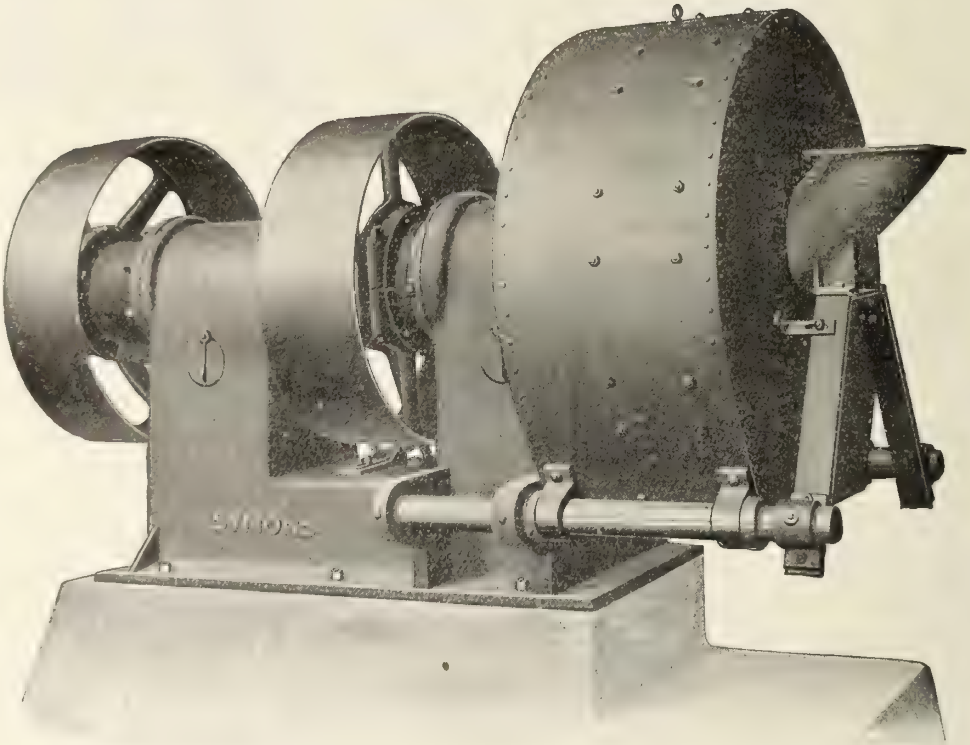

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THE

Symons Disc Crusher

Will Crush

40 Tons of ¼ inch

or

1000 Tons of 2½ inch

Per 10 Hour Day

The Only Crusher which will take rejections, screened or unscreened from standard Gyratory Crushers and reduce rapidly at one operation to ¾ inch and less.

The Only Crusher which successfully reduces wet or dry gravel boulders mixed with sand to smaller product.

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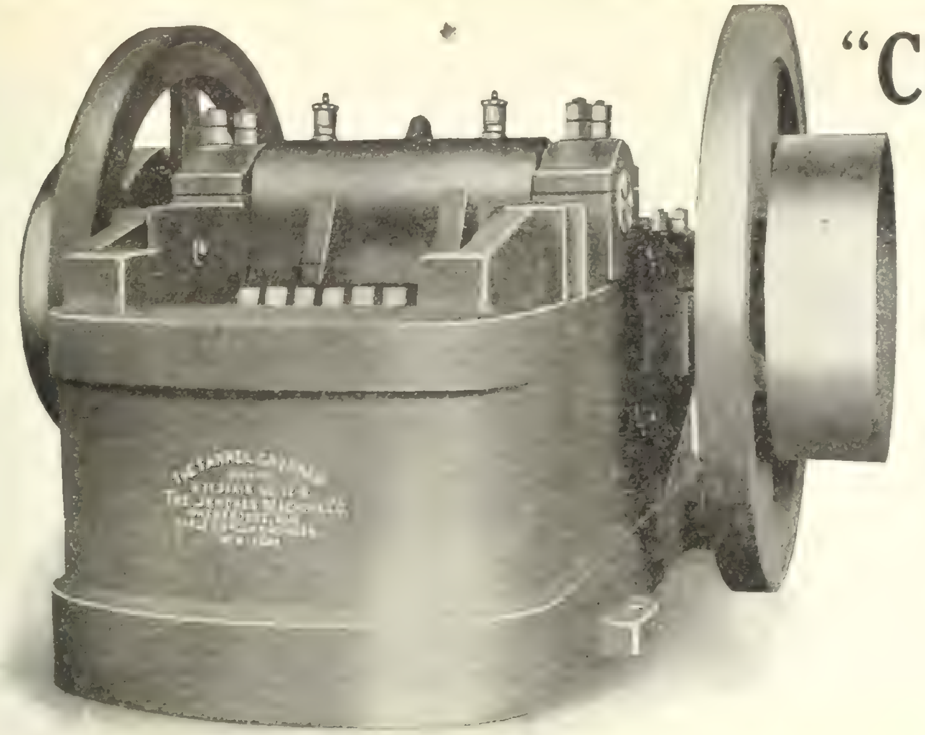

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HOISTING ENGINE

IS BUILT FOR HARD USAGE

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All Classes of Planing Mill Products

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We are prepared to take care of the largest orders on shortest notice and can guarantee prompt delivery.

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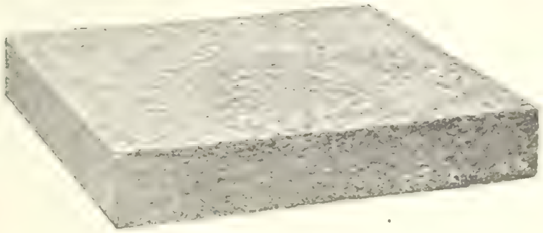

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We are prepared to furnish and install insulation for all classes of cold storage work, ice-making and refrigerating plants, breweries, packing houses, etc.

Write nearest Branch as to your requirements.

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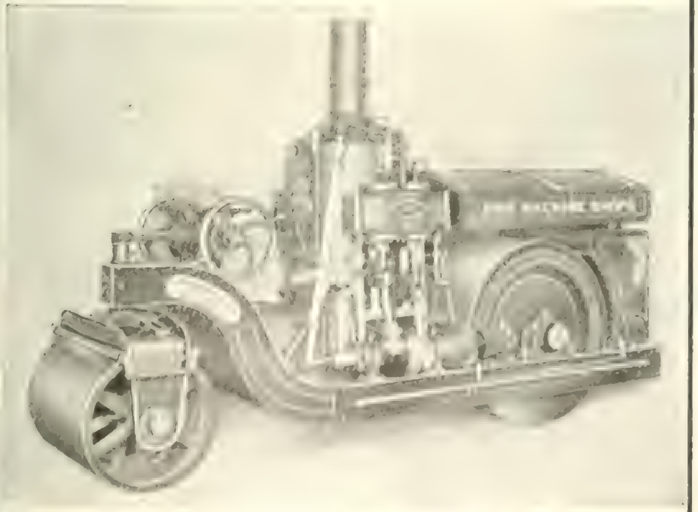
ERIE ROLLERS

Have been in active service 23 years



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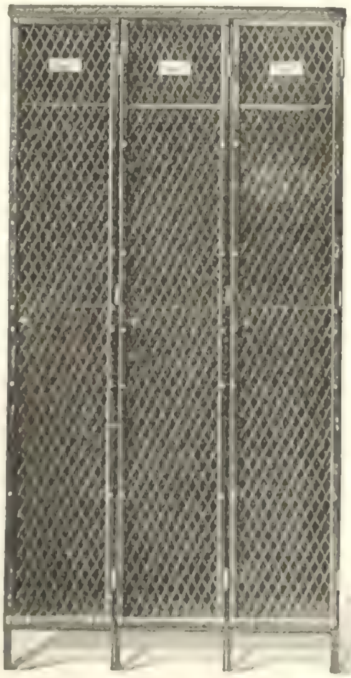

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Among lockers the "Meadows's Metal Locker" is the favorite owing to its substantial construction.

Get our booklet "Locker Lore."

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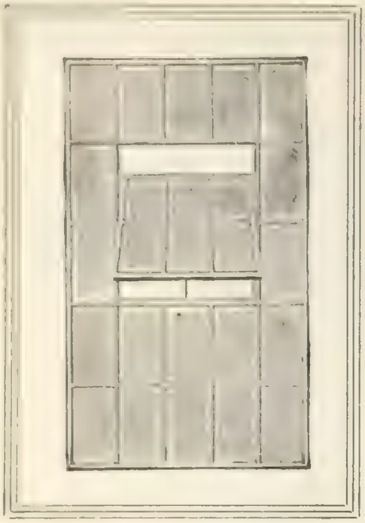

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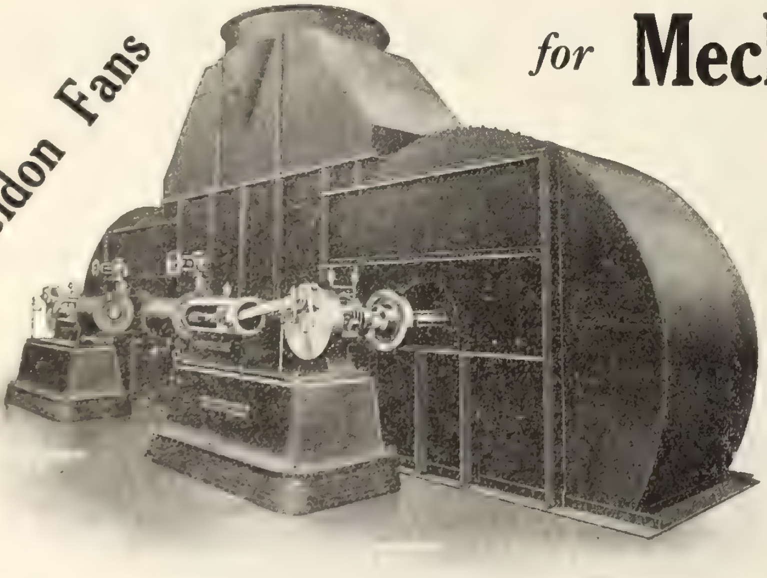

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built of concrete made with Rogers' cement and crushed stone will last as long as the city itself, requiring the minimum of repairing. See that your contracts call for Rogers materials.

Cement and crushed stone from our mills are always of uniform quality.

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Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
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Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.
Send us your probable meter requirements and let us make you a proposition.
Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

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Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.

Limited
Sydney, Nova Scotia

Busy Contractors Use New Model Aurora Dump Wagons

because they want wagons that will haul the most material in the least time and that are on the job every working hour.

A novel feature has been added to this wagon which places it beyond comparison with any other on the market, namely, **a steel channel filled with wood for the main side board,** giving unusual strength. This is the portion of the wagon that stands the heaviest strain. With this reinforced side board, breakage is practically impossible. It is short coupled and built low. Light in weight. **Write today.**

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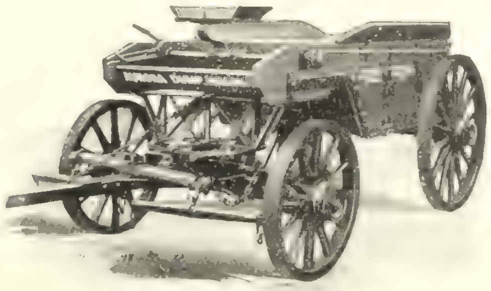

The evidence of the Overwhelming Superiority of the new Sherardized Coating on

Herringbone Metal Lath

does not depend on the statement of any interested party.

Effect of bending on Galvanized Coatings, magnified six diameters
A Hot Galvanized Coating.
B Sherardized alloy, zinc dust removed
C Electro-galvanized coating.
Note ability of Sherardized coating to withstand bending

Read the extract from the Report of Prof. Burgess, Metallurgist, of the University of Wisconsin

"In a series of tests it was shown that 0.1 gram of Sherardized coating material from an iron article, dissolved in a normal sulphuric acid in 304 minutes. Zinc from an electro galvanized coating dissolved in 50 minutes. Powdered zinc from a hot process bath dissolved in 20 minutes.

Why specify Herringbone Sherardized Lath "or equal"?

There is no equal and the price of the Sherardized coating competes with the cheapest galvanizing.

Clarence W. Noble, ***General Sales Agent***

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Metal Shingle & Siding Company, Manufacturers

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Beaconsfield Station Road, after Tarvia Modern Pavement was laid.

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Tarvia

Preserves Roads
Prevents Dust~

HERE is a road which could not stand the traffic when it only had the natural binder. The addition of Tarvia as a binder when the road was resurfaced made a wonderful difference and the roadway became of adequate toughness to resist traffic of every kind.

Tarvia is a dense, tough, plastic preparation of coal tar.

In this road, the Tarvia was applied during reconstruction. In each layer of stone Tarvia was poured to fill all the voids and form a tough, plastic matrix in which the stone was firmly set.

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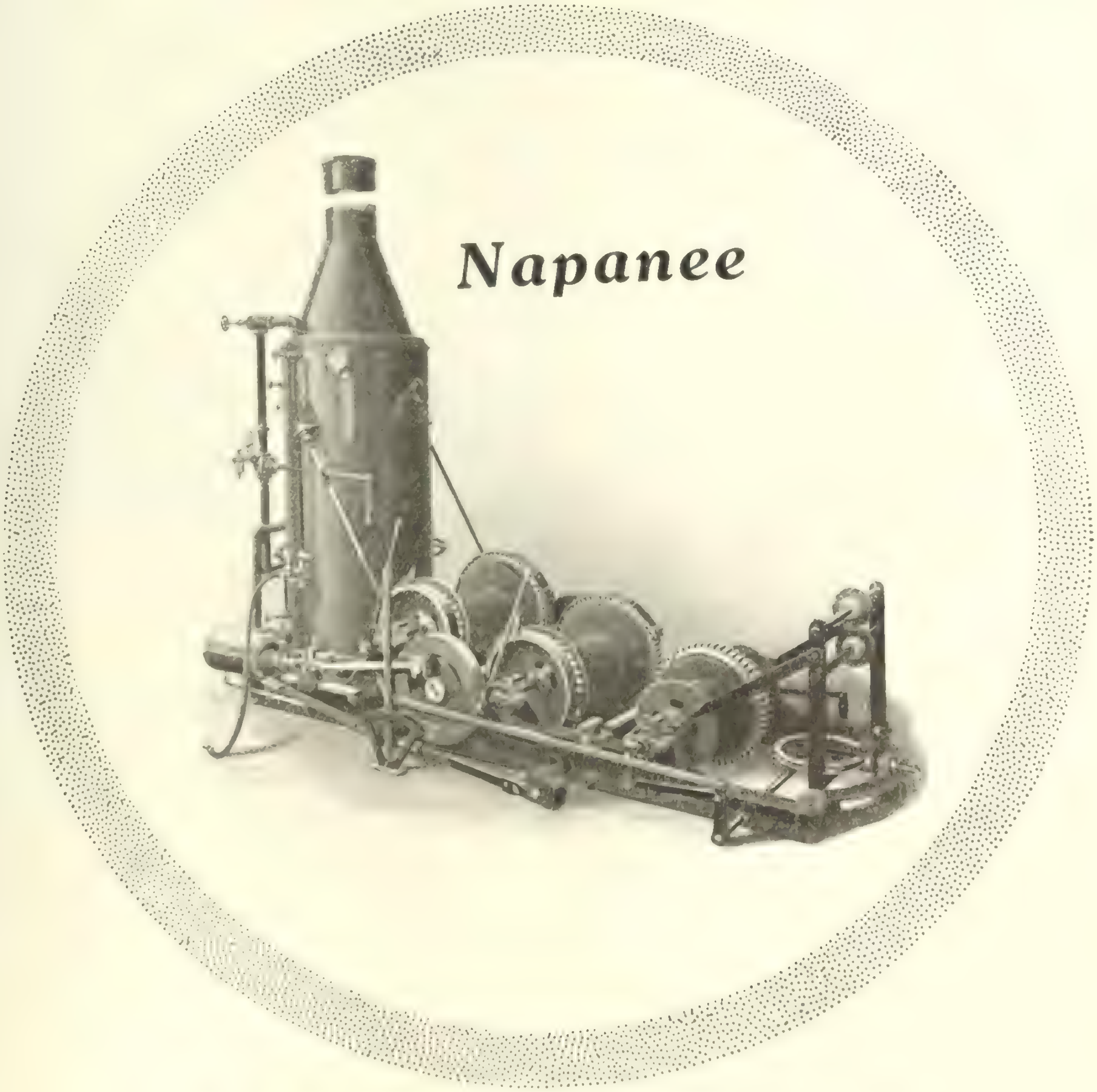

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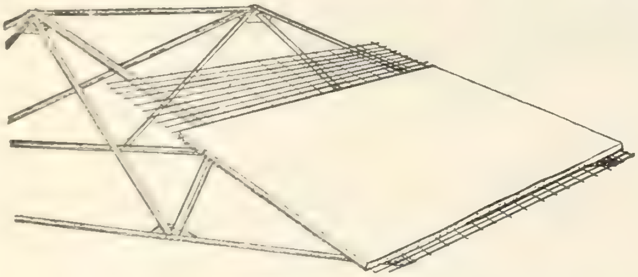

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Can you rely on them?

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A Genuine Hard Wall Plaster

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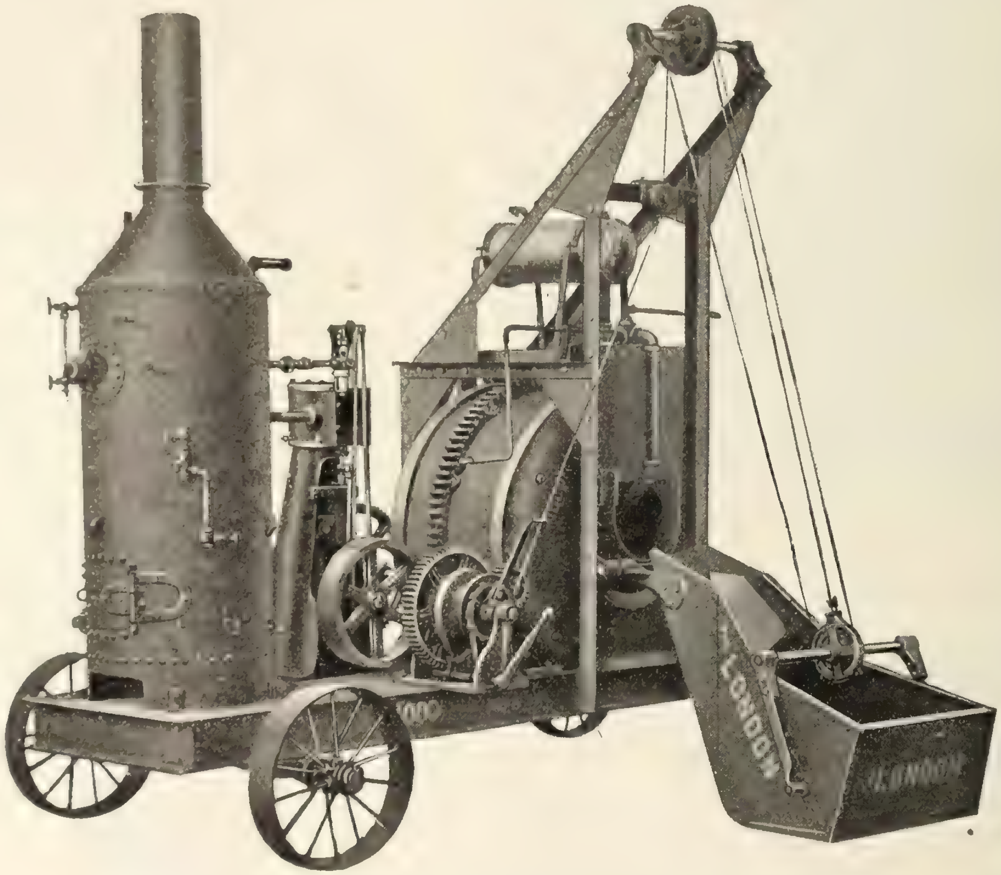
Concrete Batch Mixers

are built entirely of steel. All parts very heavy



London Standard Drum Batch Mixer, with Steam Engine,
Boiler and Power Loader

Built to run 24 hours per day the year round

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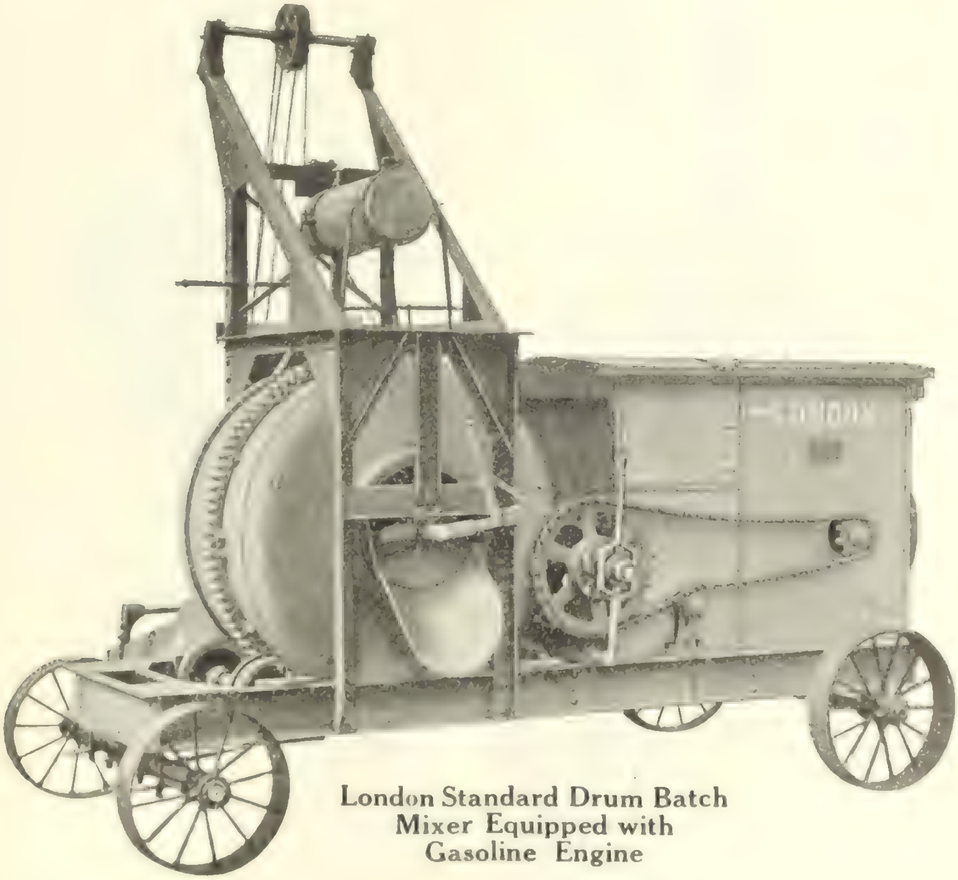
Concrete Batch Mixers

Are furnished with any equipment and are made in five different sizes. All sizes are equipped with traction drive when ordered.



London Standard Drum Batch
Mixer Equipped with
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Note the construction of this mixer. All parts very heavy. Built on the most approved designs. Embodies only the highest grade of materials and workmanship.

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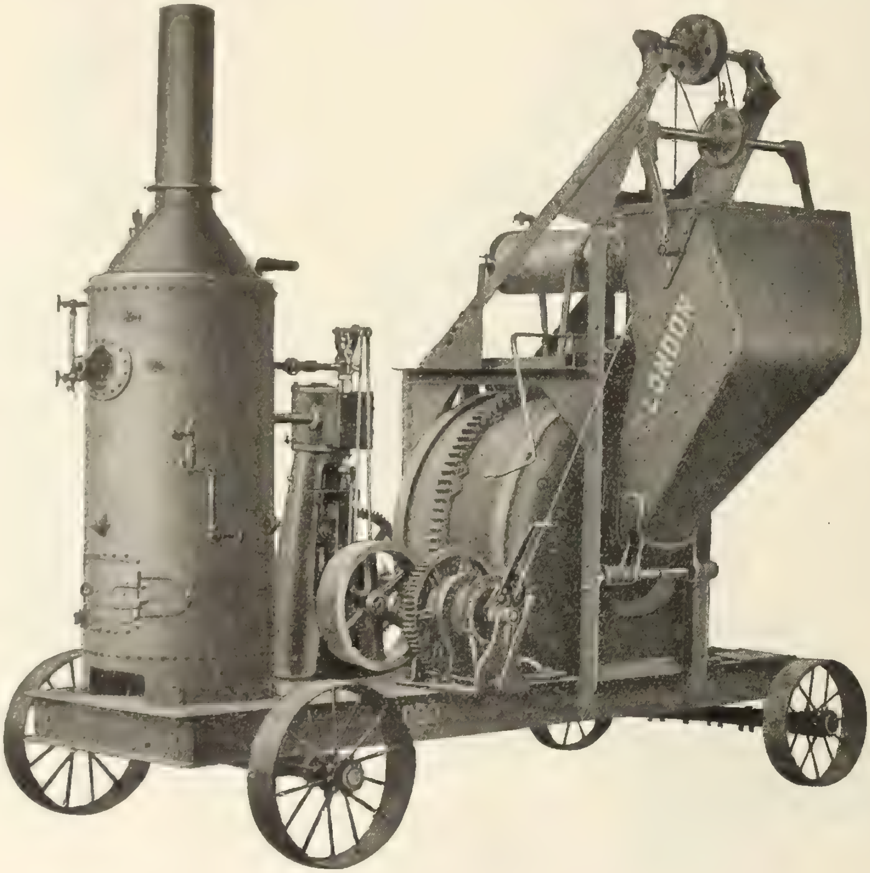
Standard Drum Batch Mixer

Our power loader will discharge perfectly clean and will not spill any of the contents on the ground.



Our power loader is operated with Standard hoisting drum and cone clutch.
The skipp raises in seven seconds.

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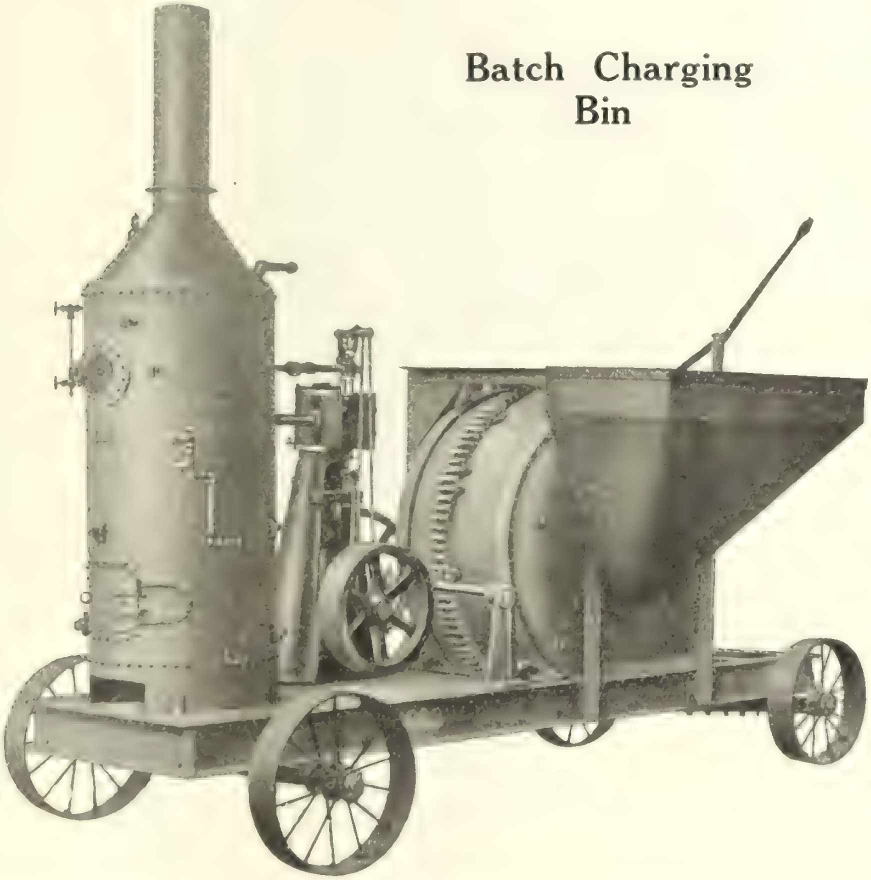
Batch Mixers

will serve you best. No contractor can afford to run a concrete mixer that is continually shutting down for repairs.



Batch Charging Bin

London Standard Drum Batch Mixer with steam boiler and batch charging bin

The London Batch Mixer will run every day the entire year, and produce a batch of concrete every minute.

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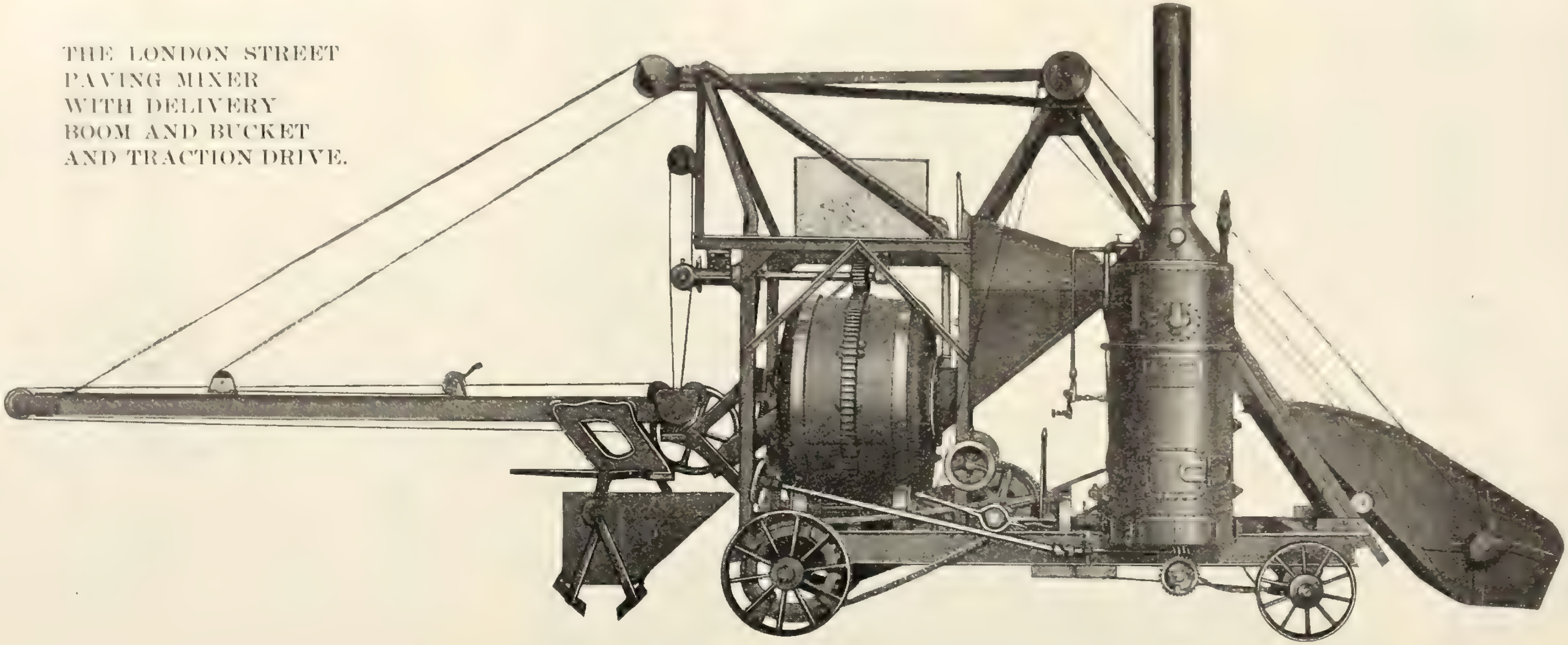
LONDON Batch Mixers

are built in several sizes and designs for all classes of work



THE LONDON STREET
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WITH DELIVERY
BOOM AND BUCKET
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This machine is also equipped with flanged wheels to fit street railway tracks

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Automatic Batch Concrete Mixer

Keep the hoppers full and
the machine does the rest.

The London Automatic Batch Concrete Mixers are built in two sizes and with any equipment. These machines are in great demand for all classes of work when the machine requires to be moved often, as they are light. The price is moderate and they will do the work as well as any machine at any price

London Concrete Machinery Co., Limited

Cabell St. and Kitchener Ave., LONDON, ONT.

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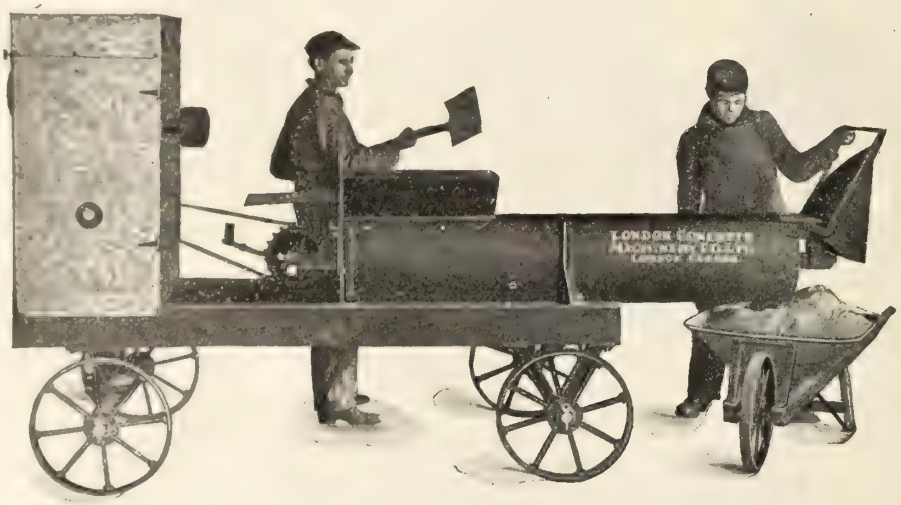
LONDON

Mortar Mixer

All Masons, Brick-Layers, Plasterers should use a mortar mixer. It will do better work than can be done by hand and do it 8 times as fast.



This is just the machine that the man who mixes mortar has been looking for.

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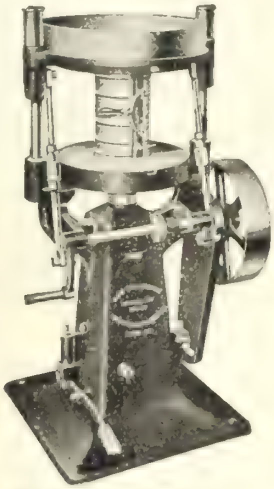
The Dunn
Cement Drain Tile Machine

makes all sizes of drain tile. There is larger profit in the cement drain tile business than any branch of the concrete industry.

Drain Tile



Dunn Tile Machine

The business can be started with a small capital.

Write us today for Catalogue

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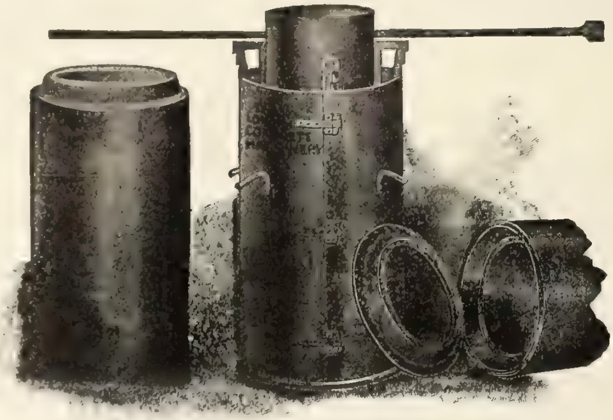
LONDON

Sewer Pipe and Culvert Moulds are built in all sizes and to meet any specifications



Steel Concrete Tile and Sewer Pipe Moulds.
Telescopic or plain jointed 4 inches to 48 inches in diameter.

All moulds are made from high carbon cold rolled steel, built very heavy and will stand the roughest usage.

Over 8,000 now in use

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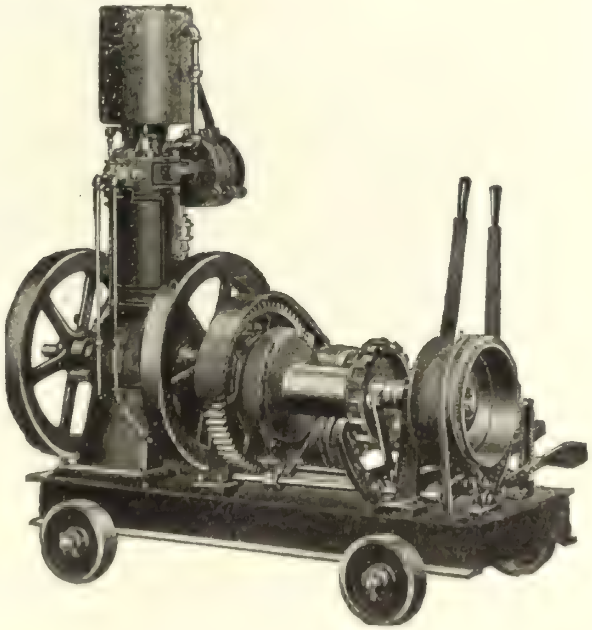
Standard Hoisting Engines

Are made in all sizes and to meet any requirements.

This is a high grade hoisting engine and is sold at a moderate price.



Write for catalogue stating your requirements

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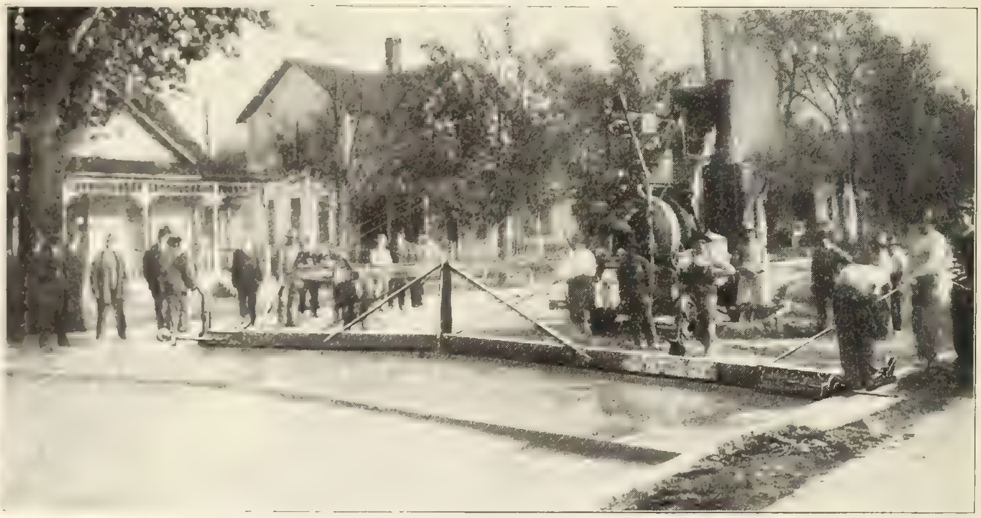
The Roughen

Adjustable Street Gauge

Will save the price of itself every month it is in use. It also insures a uniform street.



This gauge is adjustable to any grade or any kind of street.

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Cement Brick Machine

makes bricks with frog impressions, polished on all sides. Over 900 of these machines now in use. There is large profit in the manufacture of Cement Brick.

This machine will manufacture the brick on the site where the building is to be erected or in a permanent plant.

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The Best Designed Hoist

THE man in the market for hoists should enquire into the merits of the **Napanee.** He will find them better in material, more efficient in design and of better proportions than any others.

They are the result of careful study of contractors' requirements.

Shipments can be made from stock of standard sizes, with or without boilers.

Prices, specifications and photographs will be sent to interested parties.

Napanee Iron

Napanee

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NAPANEE
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"NAPANEE"
The Best
Made
Hoist

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Hoists, Rock Drills,
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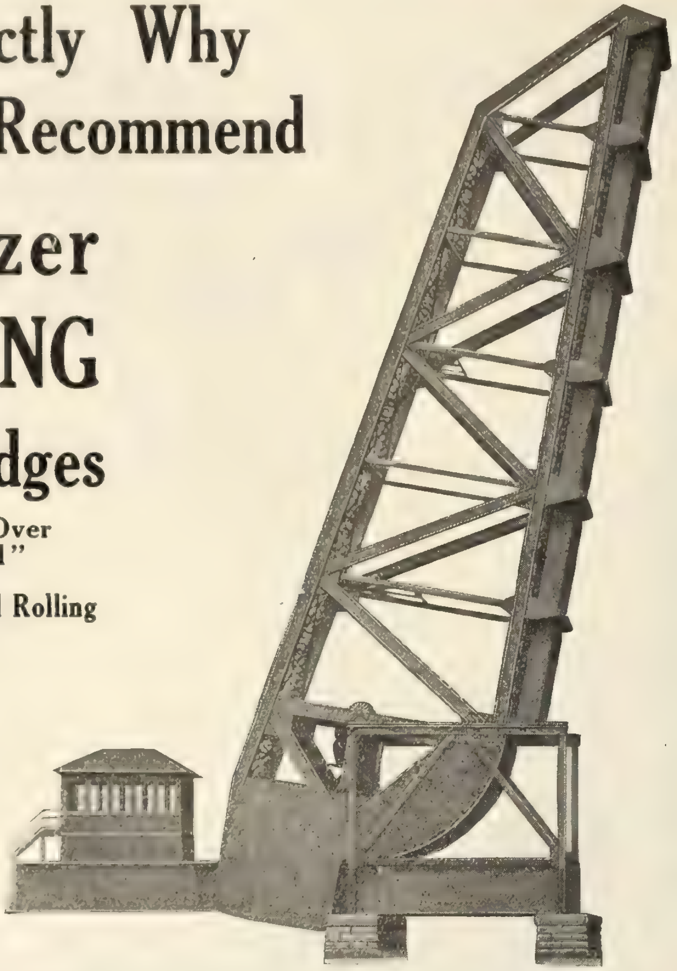
Here's Exactly Why Engineers Recommend

Scherzer ROLLING Lift Bridges

"Used All Over The World"

Designed on the Universal Rolling Principle



Notice the simple, rigid, riveted one-piece movable bridge. Extraordinary simplicity and rigidity—greatest efficiency at less cost

Some Reasons Why The Scherzer Rolling Lift Bridges Are Recommended by Engineers the World Over—

It is a riveted complete rigid structure.

Truss has no pin connections.

Very little machinery in structure—about 5 per cent. of total metal. (Machinery costs about three times as much per lb. as structural steel.)

Over 50 per cent. less MACHINERY than a design with trunnions.

So perfectly balanced as to require little power to operate.

Cost of maintenance low.

Raised and lowered without shock.

Less metal than other designs.

Gives maximum clearance of waterway without fender piles.

Machinery or truss not exposed to damage by boat lurching to side.

Concentrated loading at any point not as great as on a trunnion.

Counterweight is fixed. Height of counterweight not much over ordinary truss.

No high towers.

All parts easy of access.

No costly trunnions or heavy castings liable to be displaced.

No uplift to overcome before bridge commences to rise.

Requires shorter piers than a trunnion.

Trusses roll in direct line of standard distance c. to c. of ordinary trusses.

Grade of railway or bridge could be raised in a simple manner.

200 Scherzer Rolling Lift Bridges now in successful use in the

United States	Egypt
Canada	Russia
England	India
Ireland	Burma
Wales	Hawaiian Islands
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and other countries.

Scherzer ROLLING Lift Bridges cost less to install, operate and maintain—because they are simple, rigid, riveted structures with less metal than any other movable bridge and far less machinery. They are balanced in all positions, minimizing motor power. Their base is rounded just enough to let them roll forward and down, closing them; or roll back and up, opening them. This forward and back motion saves large amounts in material, weight and motive power, as a much shorter span can be used. When open, the bridge is back, away from the channel, preventing accidents from moving boats.

No friction-causing axles, journals or trunnions are used to carry the bridge. There is nothing to lubricate but the small motor and very simple machinery. The curved base rolls on level tracks, using the simple principle of track and wheel used by all railroads. The foundations naturally cost less because the bridge weighs less. No wharfage is needed on either side. New bridges can be added beside the old ones, avoiding wasteful replacement.

A Scherzer ROLLING Lift Bridge can be opened or closed in thirty seconds, a vast saving in time for land and water traffic. Tracks are fastened permanently to the bridge, doing away with rail lifts or end lifts and preventing accidents. When open, these bridges are barriers against accidents and signal distant traffic to stop.

The Foundations Cost Less Because the **Superstructure Is So Simple and Weighs Less**

Send for sketches, estimates and full information, showing how Scherzer ROLLING Lift Bridges are adapted for the widest channels, with particulars of demonstrated efficiency and economy.

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MONUMENTAL,
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STANDARDS
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SPECIFIC
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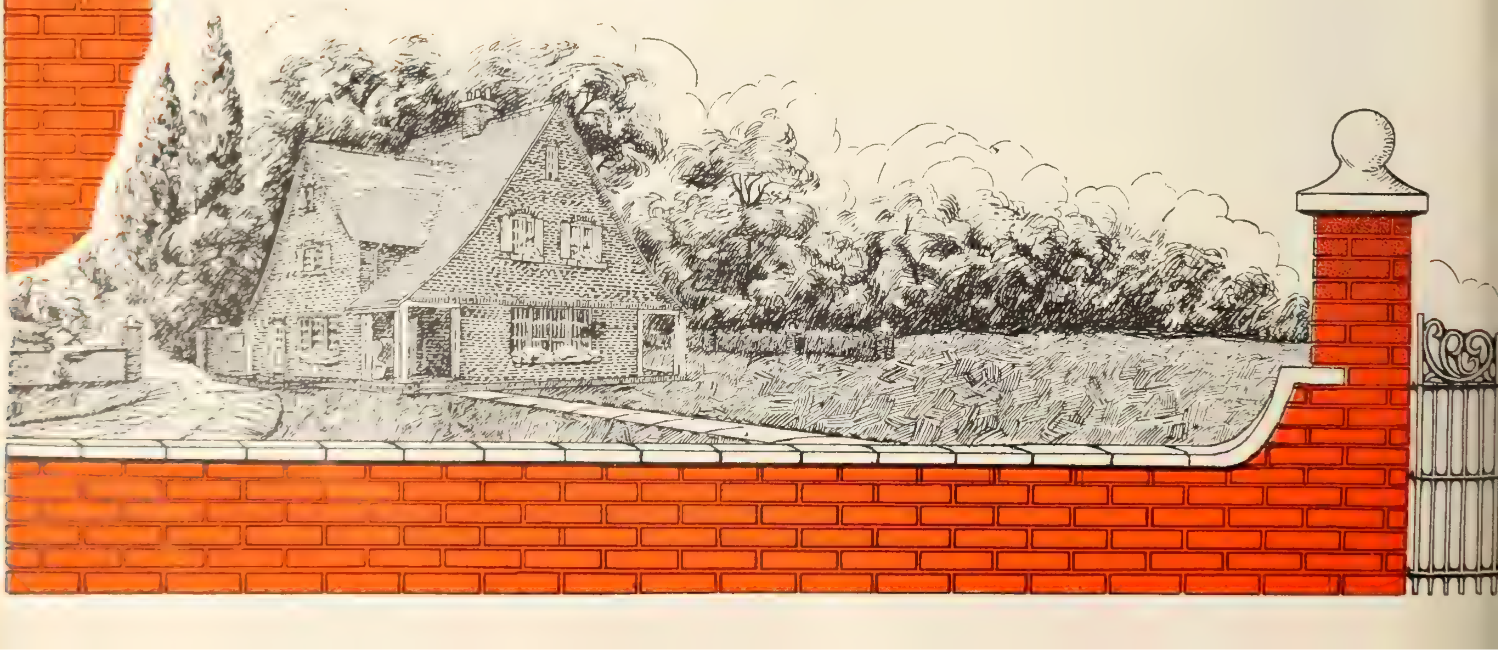
THE GORHAM CO ARCHITECTURAL BRONZE
FIFTH AVENUE NEW YORK

Don Valley

Bricks and other burned clay products have been the leading building materials since time immemorial and to-day they have to acknowledge no superior. Among the clay products of America "Don Valley" are first in point of quality, strength and uniformity. They have been chosen in competition with the leading bricks of the world.

Suited to every class of building, from a residence to a sky scraper.

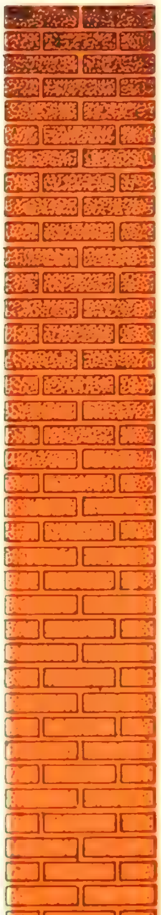
DON VALLEY
TORONTO



Clay Products

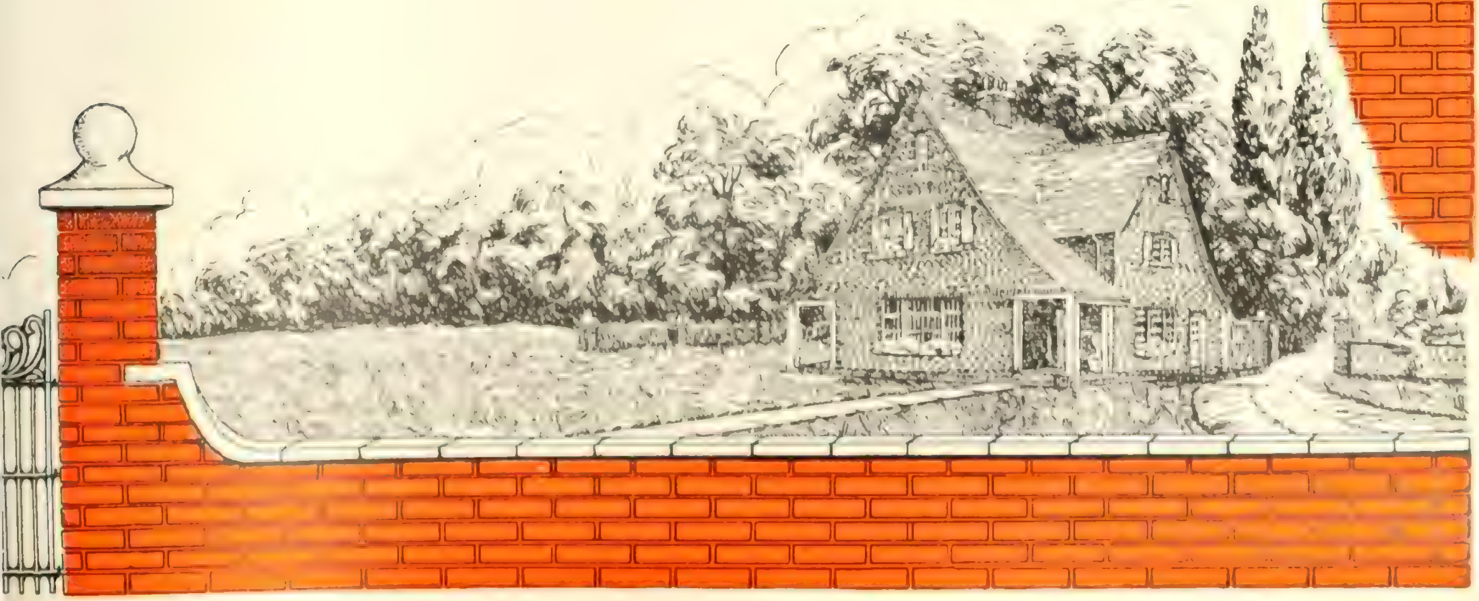
Don Valley Porous Terra Cotta Fireproofing is being used in fireproof buildings in every part of the country. This material is burned from a special clay which produces a porous block, light in weight and of unusual toughness.

For **permanent** satisfaction in a building you should use "Don Valley" Clay Products.

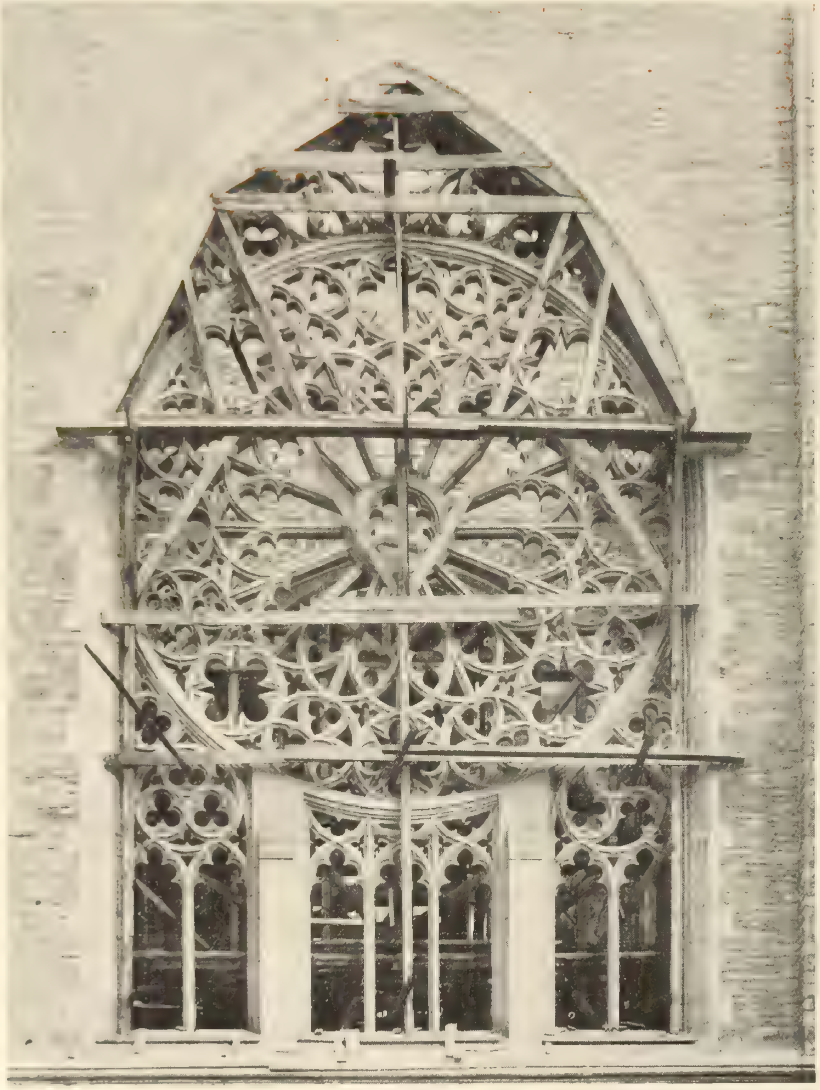


BRICK WORKS

ONTARIO



ROMAN STONE



A window of St. Paul's Church, Toronto

The illustration shows an excellent example of the architectural possibilities of Roman Stone. It is of such fine texture and so strong that it can be carved and shaped to work out the most elaborate ideas.

Roman Stone has all the ***good*** qualities of natural stone with the additional advantage of being reinforced.

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The most modern woodworking plant on this continent

Built entirely according to

KAHN SYSTEM

REINFORCED CONCRETE

This system is especially well adapted for Factory Construction.
Full information gladly furnished gratis on request.

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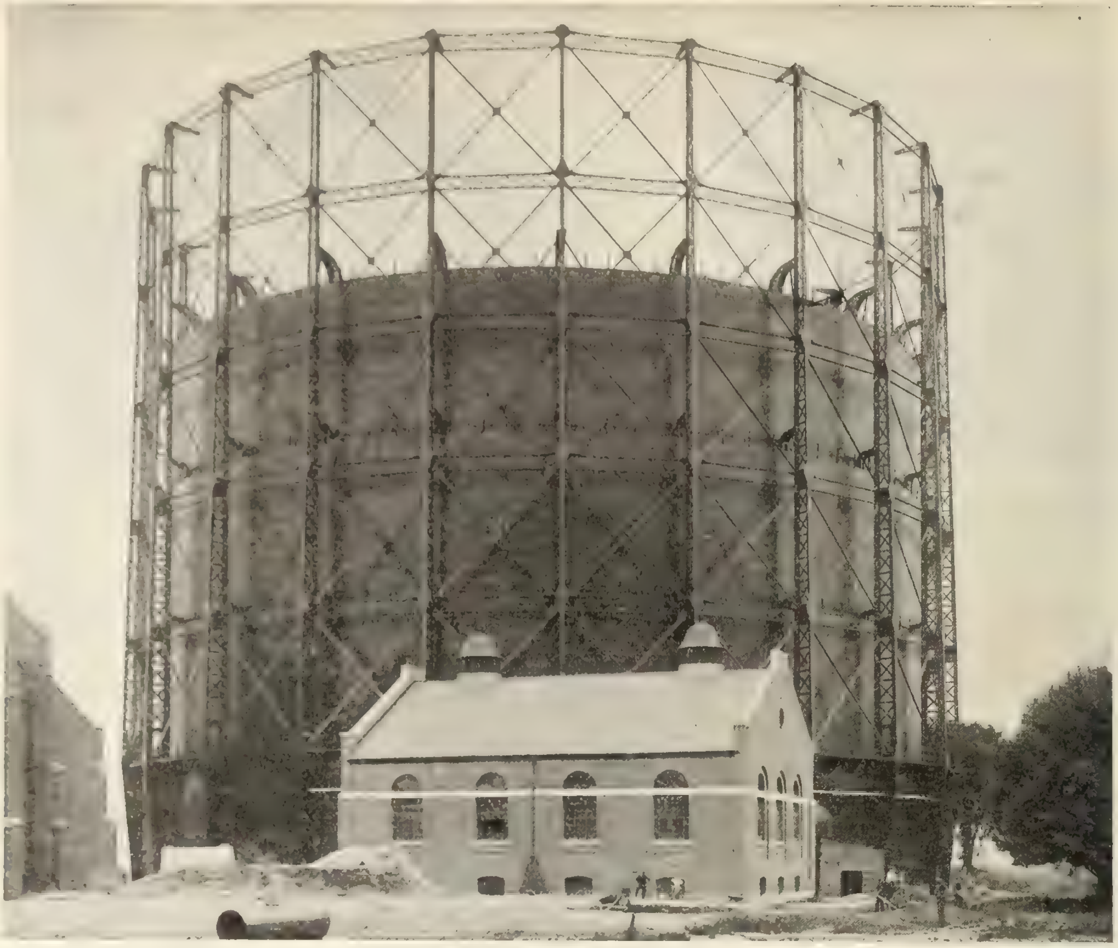
The United Electric Company, Manufacturers of Tuec Stationary Air Cleaning Systems will after May 7th, 1913 supply the Canadian trade from their new factory located in Toronto at 159-61 Richmond Street West.



GAS PLANT of CONSUMERS' GAS Co., Toronto, Canada, showing largest Gas Holder in Dominion of Canada. Erected during 1907-1908-1910-1911. All Iron and Steel in this plant preserved by CARBONIZING COATING.

Carbonizing Coating Paint

The most durable and least expensive Paint made for preserving Iron or Steel in Bridges, Buildings, Structural Shapes, Gas Plants, etc.

Galvanum Paint

The only Paint that will adhere for years to Galvanized Iron roofing, siding, cornices, etc.

Concrewaltum Paint

The only Paint that will beautify and make walls, ceilings, tile, concrete, brick and stone walls moist-proof and sanitary. Produced with strong luster finish or semi-luster, or flat finish. Can be frequently washed without injury.

Manufactured in the United States and England by

The Goheen Manufacturing Co.

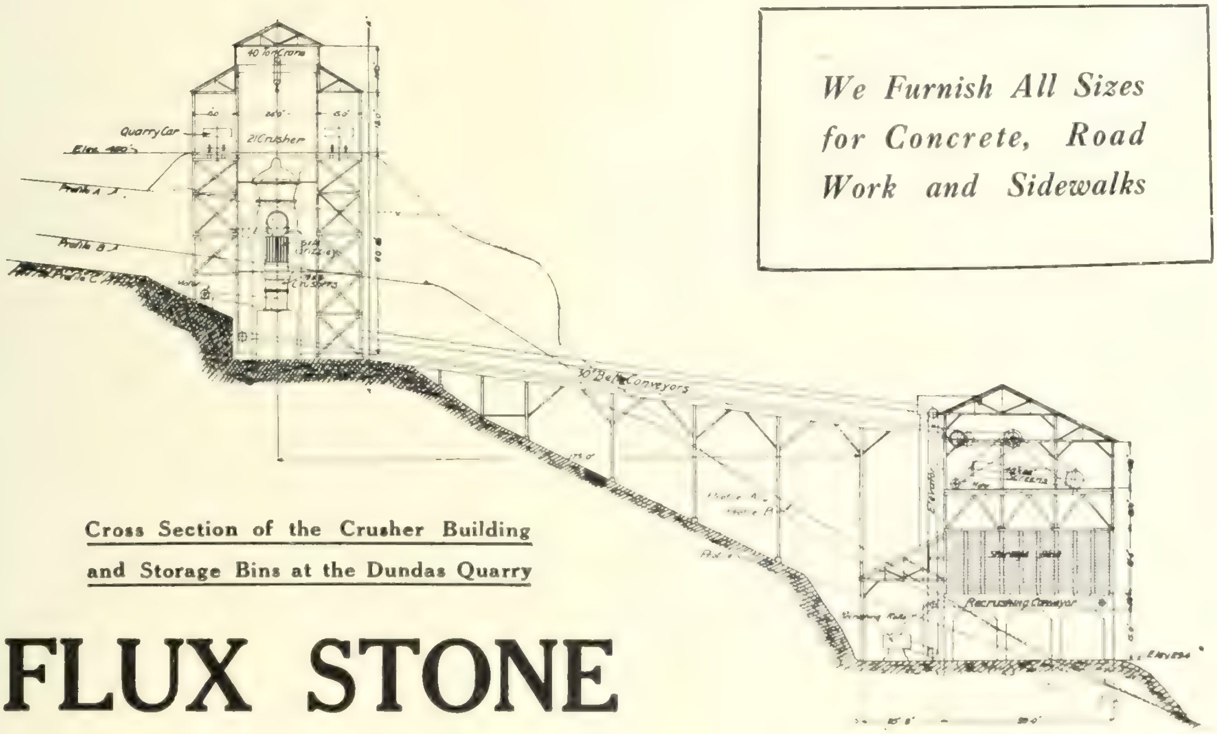
CANTON, OHIO., U.S.A., and Dock House, Billiter St., LONDON, E.C., ENG.

For sale by SANDERSON PEARCY & CO., LIMITED, Toronto, Ontario, Canada

"Dundas Stone"

Acknowledges no Superior

We Furnish All Sizes for Concrete, Road Work and Sidewalks



Cross Section of the Crusher Building and Storage Bins at the Dundas Quarry

FLUX STONE

With a bin capacity of 3,000 tons and a stock pile of 25,000 tons we can insure prompt delivery.

Alfred Rogers Ltd., Toronto, Ont.
Manager of Sales for Ontario

Canada Crushed Stone Corporation
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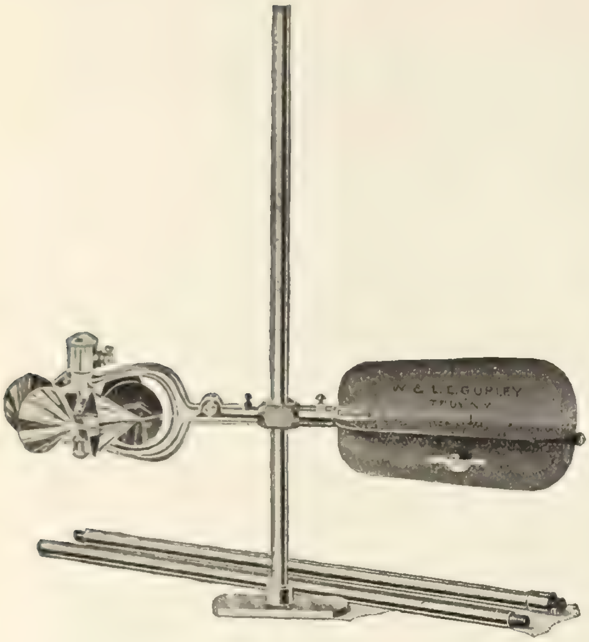
Dundas, Ontario

"Gurley" Accuracy



WE are the largest manufacturers in America of field instruments for civil engineers and surveyors.

The meter illustrated above is accurate and delicate and records in a most efficient manner.

Transits
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Field instruments for civil, mining and hydraulic engineers and land surveyors.

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TROY,
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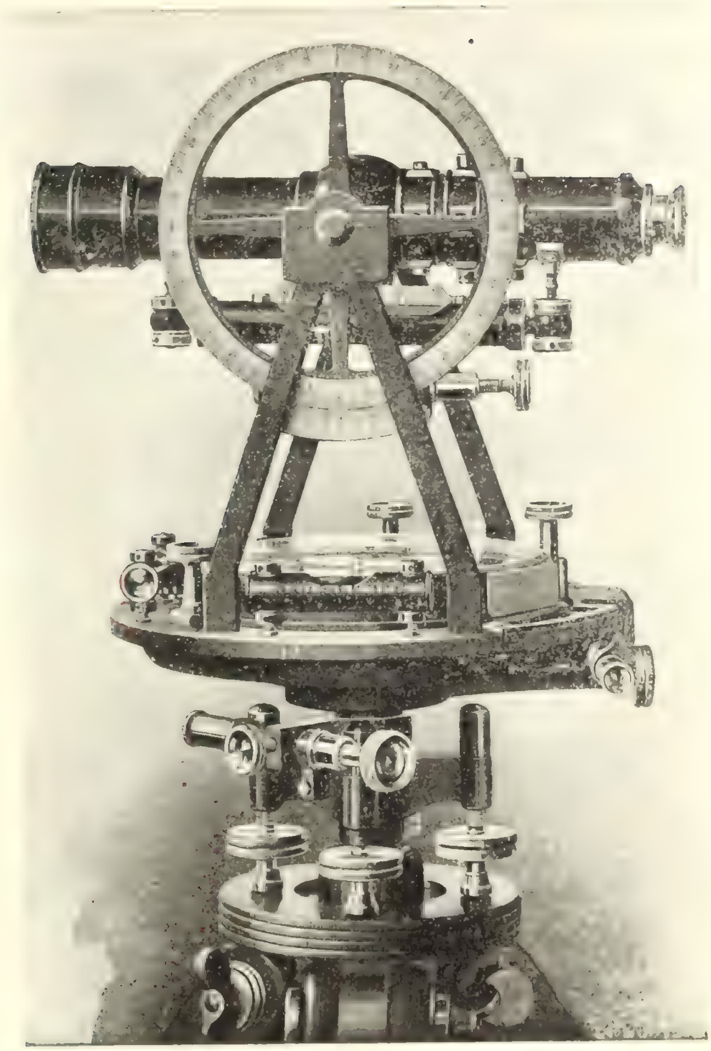
"Gurley" Quality



LIKE other Gurley instruments this transit is of fine workmanship and accuracy, and is built along strong substantial lines.

The latest edition of Gurley's Manual sent on request.

Current Meters
Leveling Rods
Chains
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Physical and scientific laboratory apparatus, standard weights and measures, accurate mercurial thermometers.

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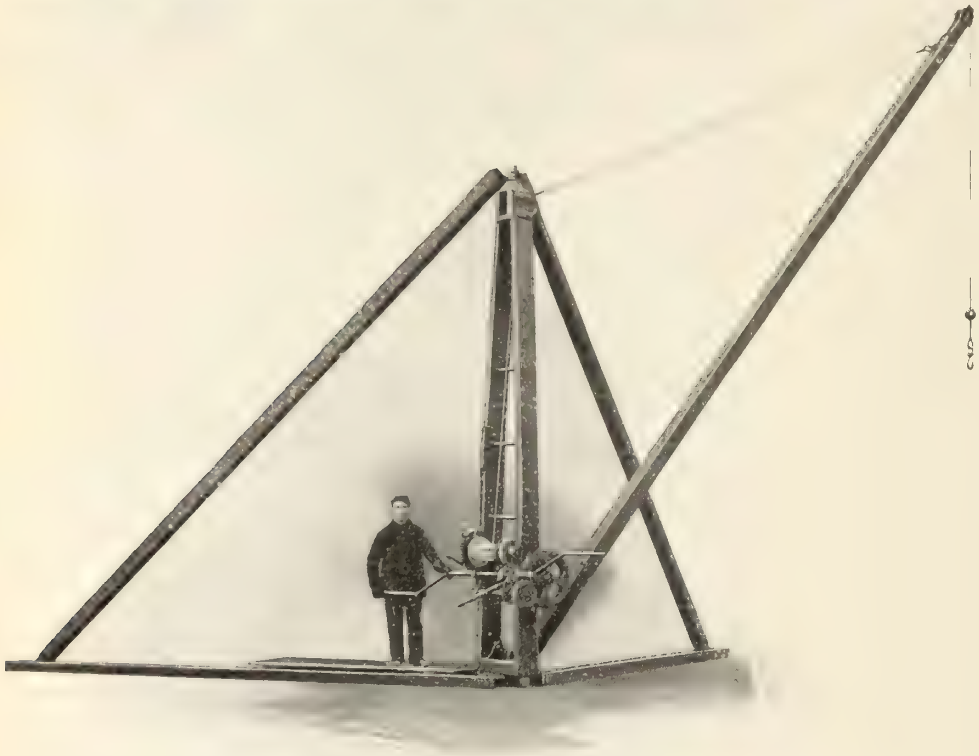
Beath Scotch Derricks



CAPACITY 1/2 TO 6 TONS

IN design and construction possess just exactly the qualifications required to perform the service you demand of them, and to handle your materials with efficiency, speed and lowest possible cost in time and labor.

Operated by Hand or Power, and can be easily changed from Hand to Power if desired.

We have the facilities for quick delivery.

Points of Construction

So made as to be easily transferred to any point.
All parts subjected to heavy stresses made of Steel, not cast iron.
Suitable provision has been made by means of pockets, etc., to keep all working parts well oiled.
Bottom Pintle Bearing is of Ball and Socket type, thus insuring easy turning movement, even when mast is not in exactly perpendicular position.
Can be changed from single to double fall if desired.

These and many other good points are combined in the BEATH SCOTCH DERRICK, and fully justifies our claim that it is the best of its kind on the market today.

Our Engineers are specialists in Derrick construction, and as a result of their efforts, we have produced a Derrick that in every sense of the word, is of superior merit, and worthy of your serious consideration.

If you are in the market now, or expect to be in the near future, you would be amply justified in submitting your inquiry NOW,—which obligates you in no way—and we will give you prices and particulars covering any capacity, Hand or Power operated, from ½ to 6 tons.

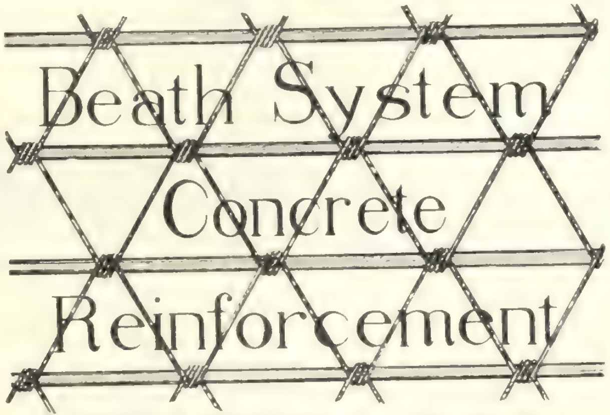
W. D. Beath & Son, Limited

20-30 Cooper Avenue, TORONTO, CANADA

The Highest Degree of Concrete Efficiency

is attained by the use of

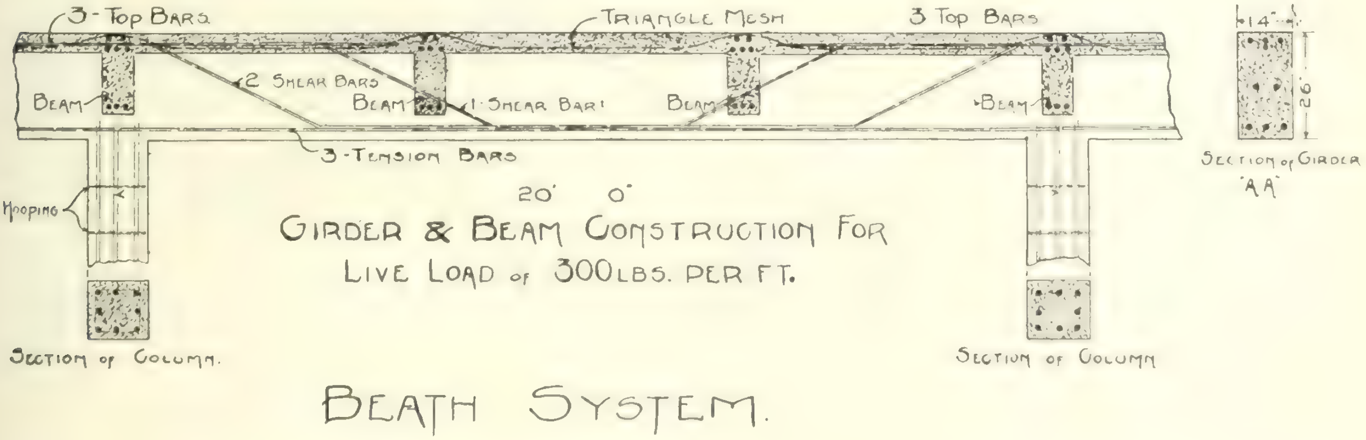
Beath Steel Bars



Detail of Reinforcement. Style No. 23

Triangle Wire Mesh

We could give argument upon argument to bear out the above statement, but what you want is "proof," and that is evidenced by the large orders being placed for this class of Reinforcement, and the representative firms who have adopted it.



Specify "BEATH SYSTEM" of Concrete Reinforcement

WIRE FABRIC for Floors, Roofs, Bridges, Dams, Sewer Pipe, Retaining Walls
BEATH BARS for Beams, Columns and Girders.

Architects and Builders receive the benefit of our Engineering experience in designing reinforced concrete construction. Simply give us drawings and necessary data, and we will submit a plan showing the entire reinforced portion of concrete work, with reinforcement in place.

Write us for further particulars today

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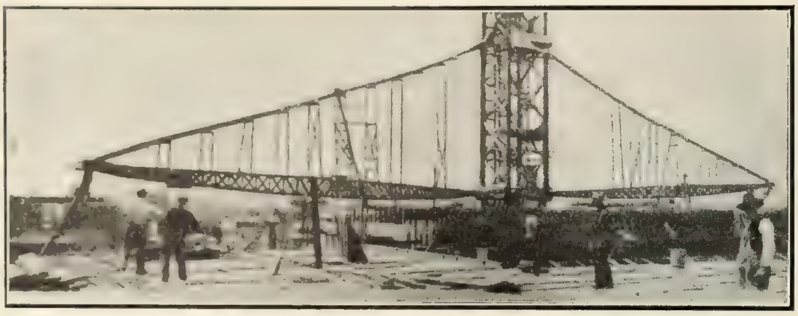
20-30 Cooper Avenue, TORONTO, CANADA

Gravity System Distributing Concrete

A system that improves the concrete and reduces the cost.



Gravity System Equipment on Large Concrete Building

Information gladly furnished and estimates given on any work.

Canadian Concrete Appliance Co., Ltd.

Sole Licencees for Canada

613 Vancouver Block, - VANCOUVER, B.C,

Eastern Representatives—**Stinson Reeb Builders' Supply Co., Ltd., - - MONTREAL, P.Q.**

The Mushroom System

Construction view of two modern fireproof Buildings for the Free Press of Winnipeg. Constructed of reinforced concrete on the Mushroom System.

The Ideal Fireproof Construction

Submit your building proposition to us

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Built With
Hamilton Pressed Brick

Mallory & Thatcher, Architects.

These fine new apartments in Toronto are being built of the popular Hamilton Red Pressed Brick

Popular, because its deep uniform red shade is always the same and never fades.

1,000,000 bricks are on hand in our yards ready for immediate shipment.

Hamilton Pressed Brick is made from shale, rich in ironoxide and free from so called soda.

It has been used in many of the leading public buildings, schools and residences throughout Canada.

Send us your next rush order.

Hamilton Pressed Brick Company
Limited

Phones

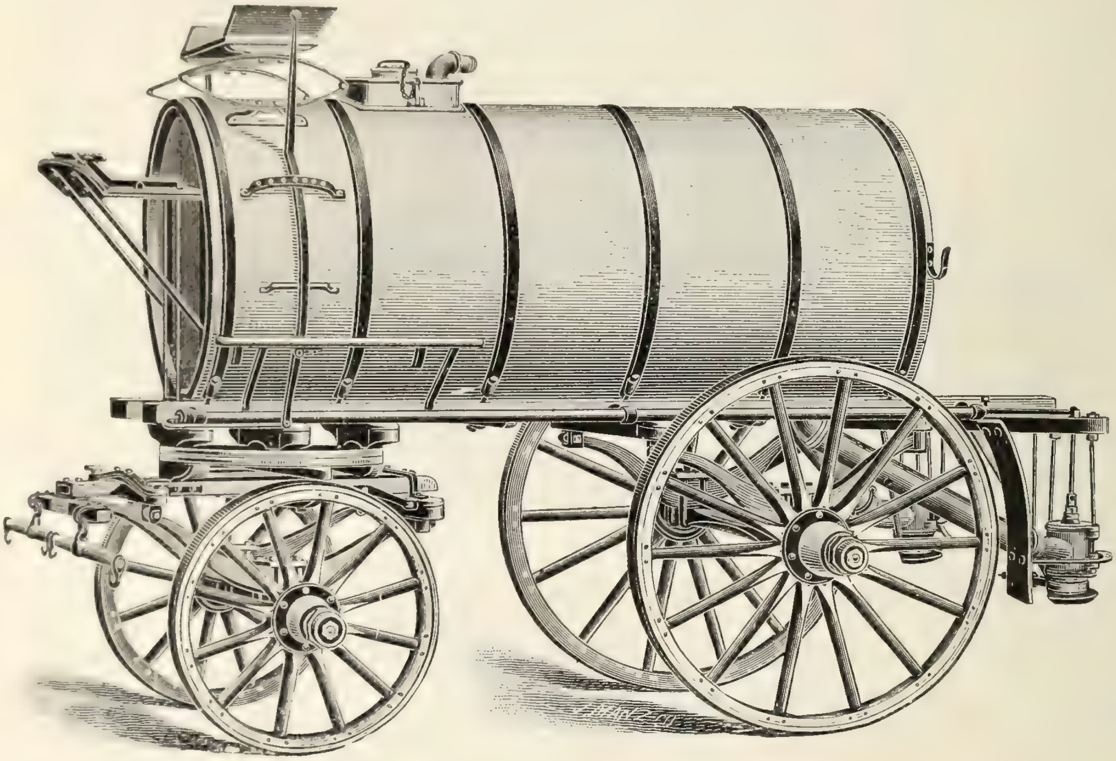
Factory	**1992**
Office	**2931**
Residence	**345**

Spectator Building, Hamilton, Ont.

Toronto Representative, WALTER HUNTER, 105 MACDONELL AVE. Telephone Park [illegible]

Most Satisfactory Sprinkler on the Market

That is what our customers say of our sprinklers and that is the reputation we are every day living up to in the manufacture of our product.



We manufacture nine-tenths of all the sprinklers used in Canada and have never failed to satisfy our customers.

We make the celebrated

Studebaker "Niagara"

and

Studebaker "Verticle Spray"

and guarantee the good working and reliability of these two makes.

Studebaker Patent Improved Sprinklers

are famous for their strength and durability—they will not easily get out of order and require the minimum of repairs.

If you are looking for efficiency in sprinklers get in touch with us—we guarantee satisfaction.

Write for illustrated Catalogue describing fully our Sprinklers and Sweepers.

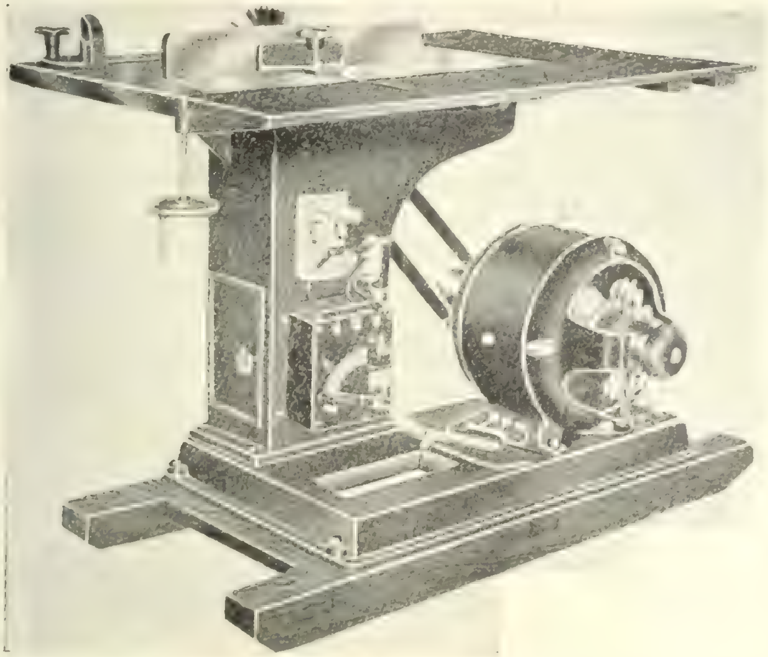
Quotations Made and Prices Given on Request

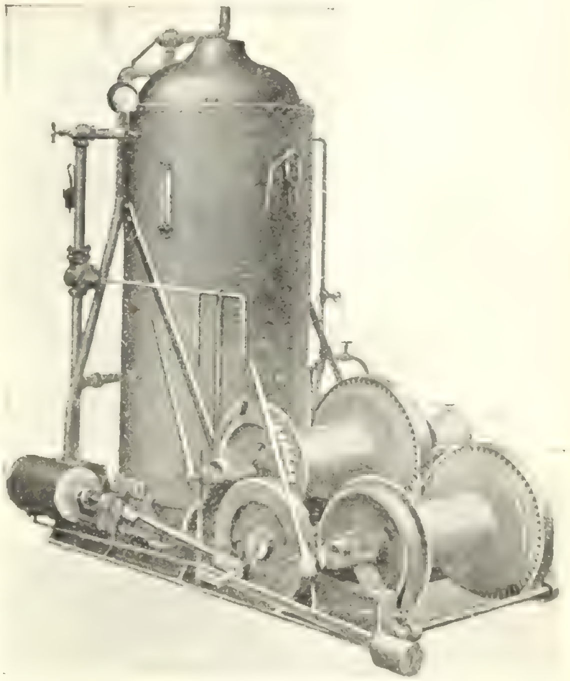
GEO. HEAMAN - London, Ont.

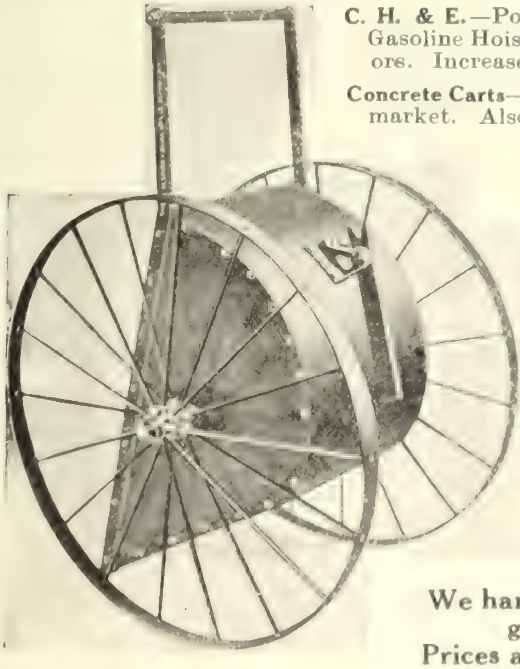
All Equipment Required for

CONSTRUCTION

—Large Jobs or Small Jobs







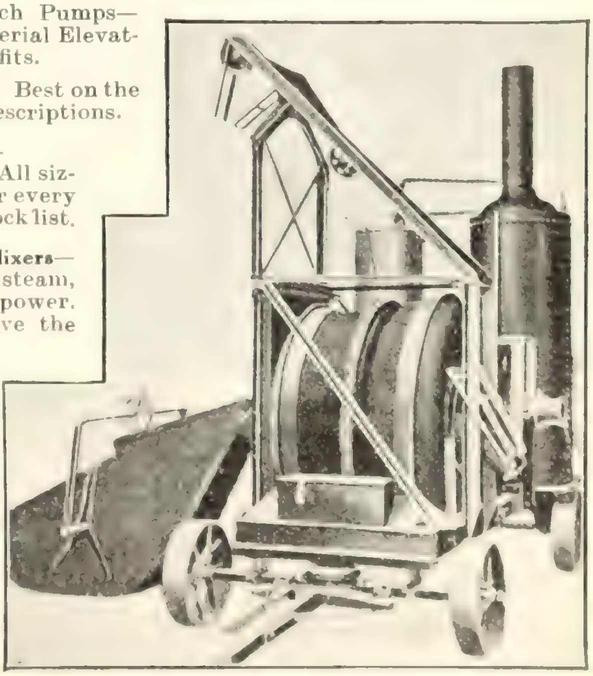
C. H. & E.—Portable Saw Rigs—Trench Pumps—Gasoline Hoists—Mortar Mixers—Material Elevators. Increase your efficiency and profits.

Concrete Carts—Six cubic feet Capacity. Best on the market. Also Wheelbarrows of all descriptions.

Clyde Hoisting Engines—Steam or Electric. All sizes and capacities, for every purpose. See our stock list.

Chain Belt Concrete Mixers—All sizes in stock; steam, gasoline or electric power. These machines have the "punch.'

Briggs Spreaders—The ideal equipment for street paving.



We handle only highest grade lines.
Prices and catalogues on application.

Dominion Equipment & Supply Co.

Canada Life Bldg., Winnipeg, Man.

Sirocco

TRADE MARK.

Blowers

"MADE IN

Interior of fan erecting shop

Unique Power and Heating Plant

'ABC" Engine driving generator, "Sirocco" Blower System Heating using Exhaust Steam, "Detroit" Return Trap System automatically returning Condensation to Boiler.

All of our own Manufacture

Productive Service

"Sirocco" Products have not previously been advertised in these columns because of the desire to await the complete equipment of our modern manufactory in Windsor. We are now able to announce to Engineers, Architects, Contractors and Owners—**an Unexcelled Productive Service.**

"Sirocco" applied to apparatus for Heating, Ventilating, Drying, Pneumatic Conveying and Mechanical Draft stands as a guarantee of highest efficiency.

"Sirocco" patented Fans and Blowers are recognized in all parts of the globe as representing a new principle in Fan design and the highest standard of construction.

"Sirocco" Fans are being specified and used in the world's largest Public, Office, Educational and Industrial Buildings. The largest and fastest Warships, Transports and Liners use "Sirocco" Fans. "Sirocco" Fans are used **exclusively** by the British Navy.

Our Complete Engineering Service is at your disposal. Will you command it? May we tender on your next requirements?

CANADIAN Sirocco COMPANY
LIMITED
WINDSOR, ONTARIO

SALES ENGINEERS

CLARK T. MORSE, 301 McGill Bldg., MONTREAL, QUE.
E. C. POWERS, Room 5, 43 Victoria St., TORONTO, ONT.

CANADA" Sirocco Blowers

TRADE MARK.

Engineering Service

As important as the type of apparatus employed is the expert knowledge of how to apply it for producing most efficient results.

In addition to employing a most capable Engineering staff, we command the entire Engineering Co-operation of the American Blower Company; also the results of years of experience of the inventor—Mr. S. C. Davidson, Belfast, Ireland.

This unique position has enabled us to secure such important business within the past year as—

Ford Motor Co.,	**Walkerville, Ont.**	**Heating**
St. Lawrence Bridge Co.,	**Montreal, Que.**	"
Eastern Car Co.,	**New Glasgow, N. S.**	"
Fisher Body Co.,	**Walkerville, Ont.**	**Dry Kilns**
Fort Garry Hotel	**Winnipeg, Man.**	**Ventilation**
Royal Trust Bldg.	**Montreal, Que.**	"
King George Isolation Hospital,	**Winnipeg, Man.**	"
Sick Children's Hospital,	**Toronto, Ont.**	"

and many others.

Carload of Canadian Sirocco Fans for one of Canada's largest Hotels

"Sirocco" Double Inlet Fan which will deliver 270,000 cubic feet of air per minute at 5" W. G.

Write for Bulletins
- Architect's Binder
- Contractor's Binder
- Engineer's Binder
- Factory Equipment Binder

Please state which

CANADIAN Sirocco COMPANY

LIMITED

WINDSOR, ONTARIO.

SALES ENGINEERS

W. P. EDDY,	214 Donald St.,	WINNIPEG, MAN.
S. S. CLARKE,	605 Second St. West,	CALGARY, ALTA.

YELLOW PINE TIMBER

Don't take any chances upon a mill delivery of Yellow Pine or Fir Timber.

We carry a stock of 20,000,000 feet in our New York yard—sizes ranging from 2″ x 4″ to 36″ x 36″, 80 ft. long.

Derrick Timber, Dredge Spuds and Trestle Stringers are our specialty.

Short Leaf Timber sizes for temporary work.

Complete working facilities including Boring and Turning of Posts.

Ask for our stock list and lumber literature.

Trexler Lumber Company
30 CHURCH STREET
New York City

Something New in Quebec

A Firm Stocking

CONTRACTORS' SUPPLIES

DERRICKS AND CRANES
CHAIN HOISTS AND BLOCKS
ELEVATORS

MIXERS
HOISTING ENGINES
CRUSHERS

PNEUMATIC TOOLS
PUMPS AND MOTORS
QUARRY CARS AND CARTS

We Solicit the Favor of an Inquiry

A. D. MASSON

Fournisseur des entrepreneurs

MACHINERIES, OUTILLAGE ET MATERIAUX DE CONSTRUCTION EN ACIER, FER ET FONTE.

30, RUE S. NICOLAS, 30

QUEBEC

SOLE AGENCY FOR THE

Weber Double Acting Floor Scraper

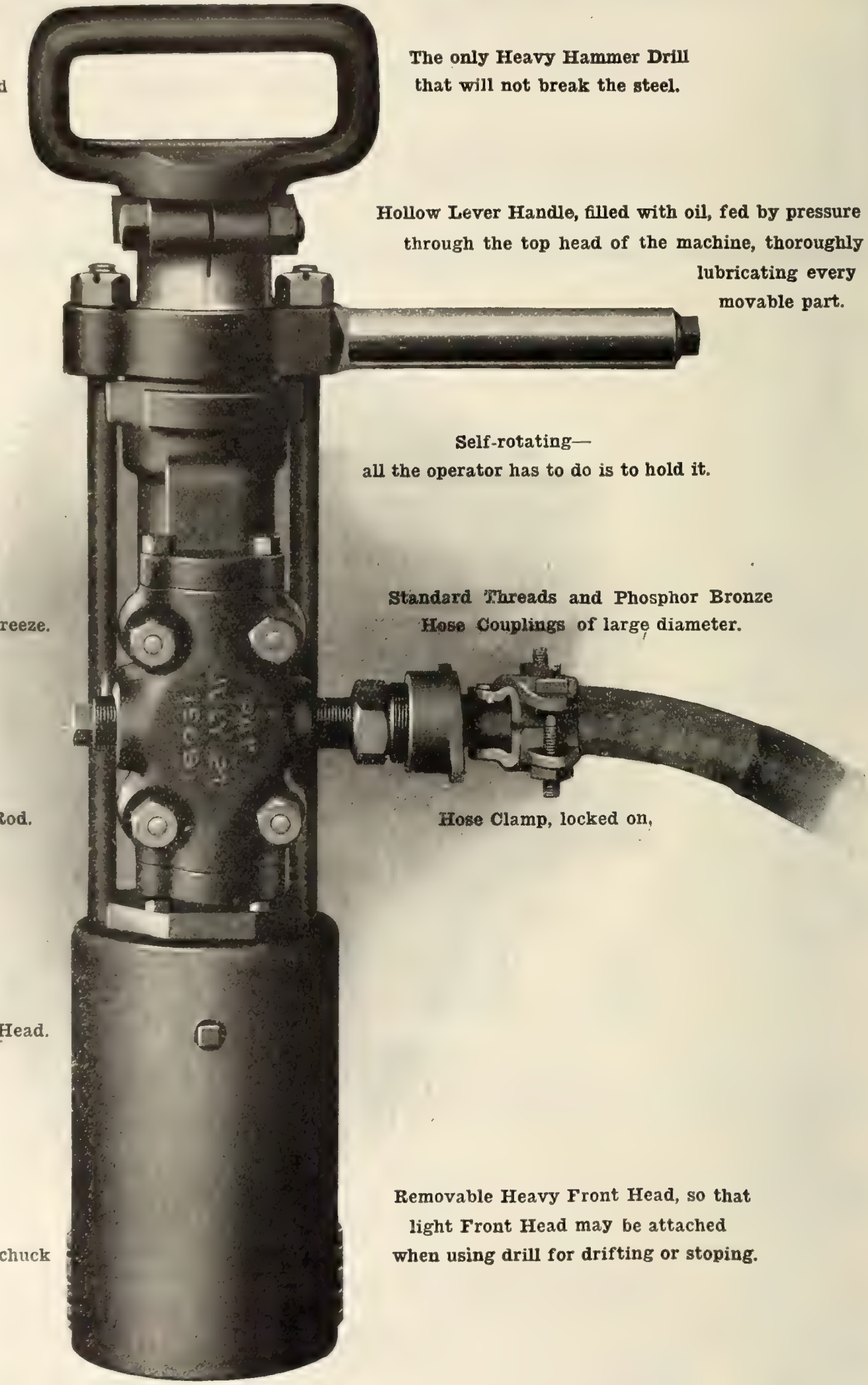
No Chattering. No Waves.

" You can push as well as you can pull."

It leaves the floor sandpapered and polished.

Don't wonder how, Ask us about it.

McKiernan-Terry Self Rotating Hammer Drill



Removable Handle, so that telescope feed may be attached when using drill for stoping.

The only Heavy Hammer Drill that will not break the steel.

Hollow Lever Handle, filled with oil, fed by pressure through the top head of the machine, thoroughly lubricating every movable part.

Self-rotating—
all the operator has to do is to hold it.

Standard Threads and Phosphor Bronze Hose Couplings of large diameter.

A Valve that will NOT freeze.

Extra Heavy Side Rod.

Hose Clamp, locked on.

Oil Plug, for Front Head.

Removable Heavy Front Head, so that light Front Head may be attached when using drill for drifting or stoping.

Either square or hexagon chuck

Canada Foundry Company, Limited

Toronto Montreal Halifax Ottawa Cobalt Porcupine Winnipeg Calgary
Edmonton Victoria Saskatoon Prince Rupert Vancouver Nelson

Ontario Lime Company
Limited
Crown Office Building Toronto, Ont.

Builder's Supplies

Lime
Portland Cement
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Hard Wall Plaster
Plaster Paris
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Sewer Pipe
Wall Coping
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Fire Brick
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Nine Yards mean prompt deliveries

118 Esplanade St. East	Phone Main 643
Pape Ave. and G.T.R. tracks	" North 4484
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12 Weston Road, West Toronto	" Jct. 479
Mimico, New Toronto St.	" Park 3971
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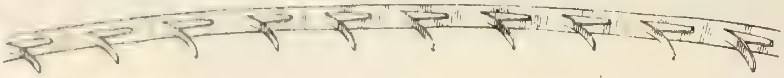
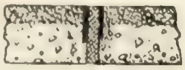
Head Office: Crown Office Bldg., Phone Main 5472
" 5473

IF you are going to build a concrete road why not take advantage of the other fellow's experience?

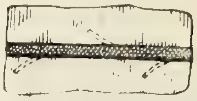
Baker Armored Concrete Pavements

mean low first cost; practically no maintenance charges; long life; and last but not least, a perfectly smooth and even road surface, entirely free from ruts or projections.





Note simplicity of construction
No attached parts to work loose



Baker Armor Plates and Baker Methods

produce results obtainable in no other way.

1,250,000 square yards of Baker Armored Concrete Pavement are now in use in fifty cities.

THESE MEN APPRECIATE GOOD ROADS

"I have motored over the best roads in Europe, and have never found any that equal your pavement."
Wm. H. McGregor, President, National Twist Drill and Tool Co.

"It is without doubt the smoothest piece of roadway I have ever seen."
Frank H, Whelden, President, The Automobile Club of Detroit.

"I have never in my life ridden over a better surfaced mile of road."
S. D. Waldon, Vice-President, Packard Motor Car Co."

"The traction seems to be perfect, and the appearance pleasing to the eye."
Cullen Brown, Treasurer, Detroit Automobile Club.

We welcome enquiries from Engineers, Road Officials and Contractors in reference to Baker Armored Joints, Installation System and Labor Saving methods.

Write for our 1913 Literature

The R. D. Baker Company

73 Home Bank Bldg., DETROIT, Mich.

Between the Tracks

it pays to pave with our asphalt block. BECAUSE it's durable, sanitary, noiseless, non-slippery, cheapest in the long run and EASY TO TAKE UP.

The block can be removed for track repairs and the same block laid again with the minimum of time and effort.

No ruts—no melting in hot weather.

Ontario Asphalt Block

With our Block a smoothly-curved neat-looking roadway can be permanently obtained.

Champs de Mars Street, Montreal

Ontario Asphalt Block Company

Windsor, Ontario **Works at Walkerville**

"Superior Graphite Paint"

was used to protect the steel in these furnaces because the paint is unaffected by heat, gases, smoke or weather exposure. It is

The Most Serviceable Paint For ALL Trying and Unusual Conditions

"Superior Graphite Paint" is made from pure Lake Superior Graphite Ore—an inert and perfect paint pigment. This ore is ground to an impalpable powder and mixed by heavy machinery with the purest linseed oils. The mixture is a paint that gives **real service** and **low maintenance cost** on all classes of surfaces. Equally durable on

BRIDGES
BUILDINGS
STRUCTURAL STEEL
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ROOFS (Metal and Canvas)
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Information and Prices will be gladly furnished by any Branch Office

Made only by

Dominion Paint Works, Limited

Walkerville, Ont.

Montreal
Toronto

Winnipeg
Vancouver

RU-BER-OID ROOFING

(Trade Mark Registered)

Gives Longest Service Per Dollar of Cost

ACCURATE tests of various roofing materials—slate, tile, prepared roofings, composition roofs, metal, and wooden shingles—have proven conclusively that RU-BER-OID Roofing costs least per year of service.

RU-BER-OID is the original prepared roofing. The first roofs laid with RU-BER-OID, 22 years ago, are still weatherproof and appear to be good for years more of service.

RU-BER-OID is unaffected by extremes of temperature, by the severest weather conditions, or by gases, fumes or acids, and so can be used where other roofings would be practically useless. As it is light in weight, it saves in cost of roof framing. It can be laid by unskilled labor at very small expense.

RU-BER-OID has many special uses, such as a waterproof covering over concrete roofs (Chateau Laurier, Ottawa) and as a waterproof layer in bridges under which traffic passes (over C.P.R. tracks on Notre Dame St. East, Montreal.)

KA-LOR-OID Roofing

(Colored Ru-ber-oid, Can. Patents Nos. 93,027 and 93,160)

KA-LOR-OID Roofing is exactly the same roofing as the regular slate-colored RU-BER-OID, with the addition of a color. By our patented process the beautiful, soft shades of red and green are made an integral part of the roofing, so that they are absolutely permanent.

KA-LOR-OID is especially suitable for high-class residences and country houses, and for schools, churches and other public buildings, where its fire-resisting properties make it a valuable protection.

SOVEREIGN Sheathing Felt

compared with ordinary building papers is like a thick woollen blanket compared with an ordinary cotton sheet. It is really light-weight RU-BER-OID Roofing saturated with the same tasteless, odorless gum which gives RU-BER-OID its recognized superiority.

SOVEREIGN FELT is waterproof—will not mould, rot, dry or crack and is strongly fire-resisting.

*Write us for Booklets, samples and full information
about these three superior products.*

The Standard Paint Co. of Canada, Limited

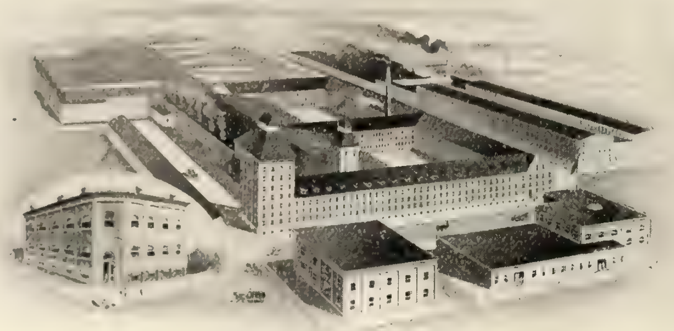
286 St. James St., Montreal
424 6th Ave. East, Calgary

Keewayden Block, Winnipeg
Hamilton & Davie Sts., Vancouver

The

B. Greening Wire Co.

Limited



Works and Head Office

MANUFACTURERS OF

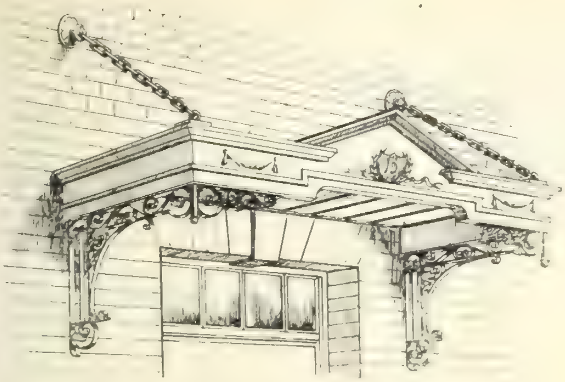
Wire Rope Wire Cloth Perforated Steel, Brass
Copper and Zinc Steel Wire Chain
Trussed Steel Wire Lathing Steel Wire Reinforcing
Wire Window Guards
Antique Rustless Bronze Screen Cloth

Catalogue and Samples on application

The B. Greening Wire Co.

Limited

Hamilton, Ont. Montreal, Que.

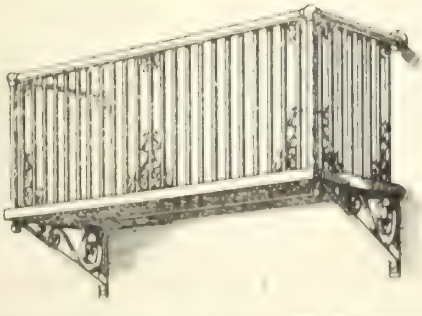


Specialties in Wrought Iron Brass and Bronze

Wrought Iron Door Grilles
" " Brackets
" " Balconies
" " Marquises
Lanterns and Lamps
Lamp Standards
Grilles and Railings
Stair Railings
Fire Escapes
Metal Lockers

We make a specialty of executing intelligently, special designs for architects, in iron, brass, or bronze.

Catalogue on request.



Dennis Wire & Iron Works Co., Limited

London, Ontario

Toronto Office, 36 Lombard Street

218 TROY Trains Making Good

"Making Good" means hauling for one-fourth to one-half what it costs with teams.

218 Troy trains have done your experimenting for you. They are distributed from coast to coast and from the Lakes to the Gulf—some abroad.

Troy Reversibles haul anything from crushed stone to sewer pipe. You can get Reversible dumpers or Reversible spreaders or Reversible platform trucks.

Many of the 218 have met and conquered conditions many times worse than yours. Every one of the 218 has cut its owner's hauling costs at least in half.

Reversibles can do it for you too. Think what a 50 to 80% cut in your hauling cost would do to your profits. Make us prove up. Ask for Hauling book Z.

The
Troy Waggon Works Co.
N. Market St. TROY, OHIO

Standard Supply
& Equipment Co.,
1710-12 Market St.,
Philadelphia, Pa.

Gentlemen:—

We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding Company

Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

MILWAUKEE, WISCONSIN

Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

The Canadian Bridge Company
Limited
WALKERVILLE, ONTARIO

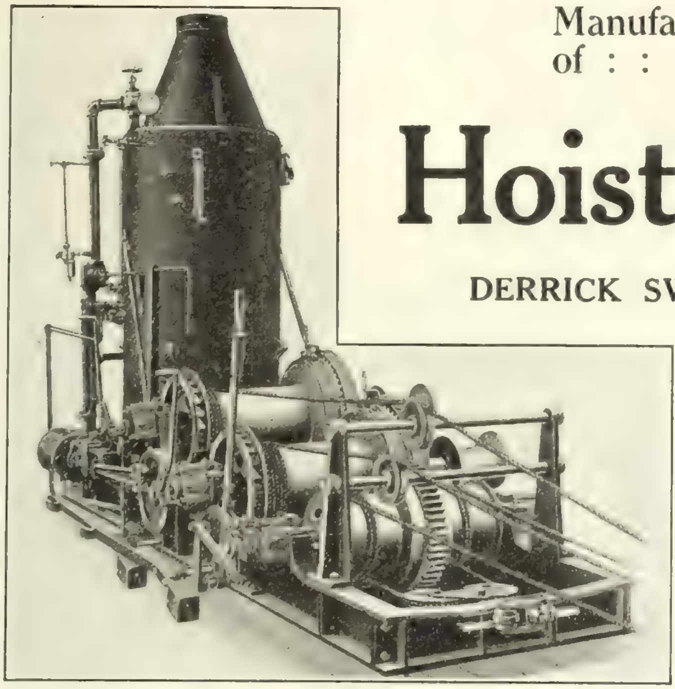
PRODUCTS Steel Railway Bridges, Steel Highway Bridges, Locomotive Turntables, Office Buildings, and Galvanized or Painted Electric Transmission Towers.

CAPACITY 40,000 Tons per Annum.

The Skeena River Bridge, British Columbia, Grand Trunk Pacific Railway, three 240 Foot Spans and three 70 Foot Spans, the former erected by Cantilever Method from one end.

DESIGNS AND ESTIMATES Architects and Engineers are respectfully requested to accompany their inquiries with plans, specifications and full data.

The Doty Marine Engine and Boiler Co., Ltd.



Manufacturers of : : : : : : **Superior**

Hoisting Engines

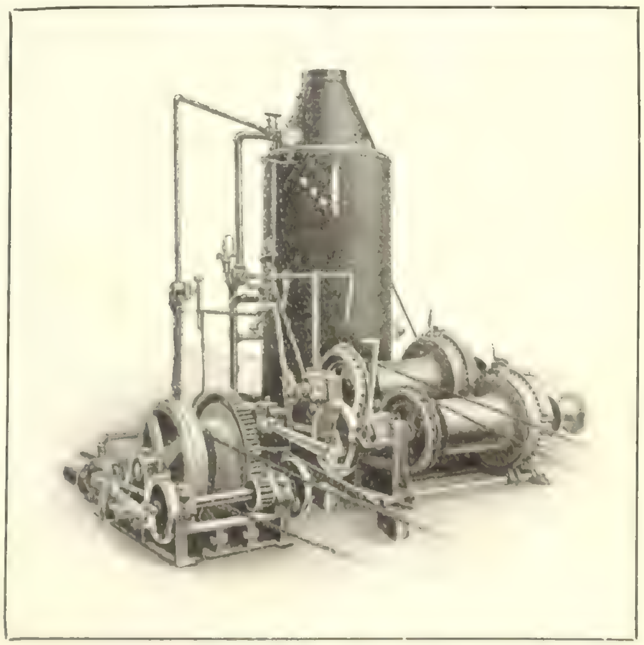
DERRICK SWINGERS, MATERIAL ELEVATORS

SAFETY MINE CAGES, ETC.

MARINE ENGINES AND BOILERS

This half-tone illustrates our Double Cylinder, Double Friction Drum Hoisting Engine with Improved Pony Friction Drum Boom Swinger attached. Its general appearance will manifest the superiority of our designs which appeal to every buyer and user of our Hoisting Engines. Note the trolley in front permitting the double sheave tighteners to travel back and forth as the swinging ropes wind and unwind from the pony drums alternately, thereby avoiding the ropes crossing over each other on the drums; also the rigid stands with extra large shafts carrying two bronze bushed sheaves leading the hoisting ropes clear over the swinging drums. Our ratchets are cast separate from the drum flanges and the pawls drop out automatically when released and remain out until engaged by the operator. The crank pins are extra large and the connecting rods of steel, cross heads of the hanging type working on steel guide bars and improved throttle valve comprise the leading external features of our improved Hoisting Engines.

This cut illustrates our Hoisting Engine in combination with our independent Steam Derrick Reversible Swinging Engines. The advantages of an independent swinger are, increased power of the main hoisting engine, increased swinging power, easier control, while the division of weight into two machines facilitates change of position more readily and permits the engine being closer to the derrick where limited for space.



Our single drum builders' Hoisting Engine having double cylinders with reversing link motion and large sheave wheel for operating two cage material elevators furnished complete with all sheave wheels, wire rope guides and tighteners is the most substantial constructed machine and in every way the most complete and durable outfit for the building contractor.

For further particulars, prices and deliveries, write

The Doty Marine Engine and Boiler Co., Limited

GODERICH, CANADA

The Doty Engine Works Co. of Winnipeg, Ltd.

WINNIPEG, MANITOBA

To buy our Engines is a Guarantee of satisfaction

Mannesmann Steel Tubes

for all purposes

Weldless spigot and faucet pipes up to 12 inches in diameter.

Lapwelded pipes up to 60 inches in diameter

for

Waterworks Schemes

Hydro-Power and Gas Mains

Weldless steel steam pipes.

Superheater, stay and boiler tubes.

Gas cylinders in seamless steel for Ammonia, C O_2, Blaugas, Oxygen, etc., etc.

Write for booklet

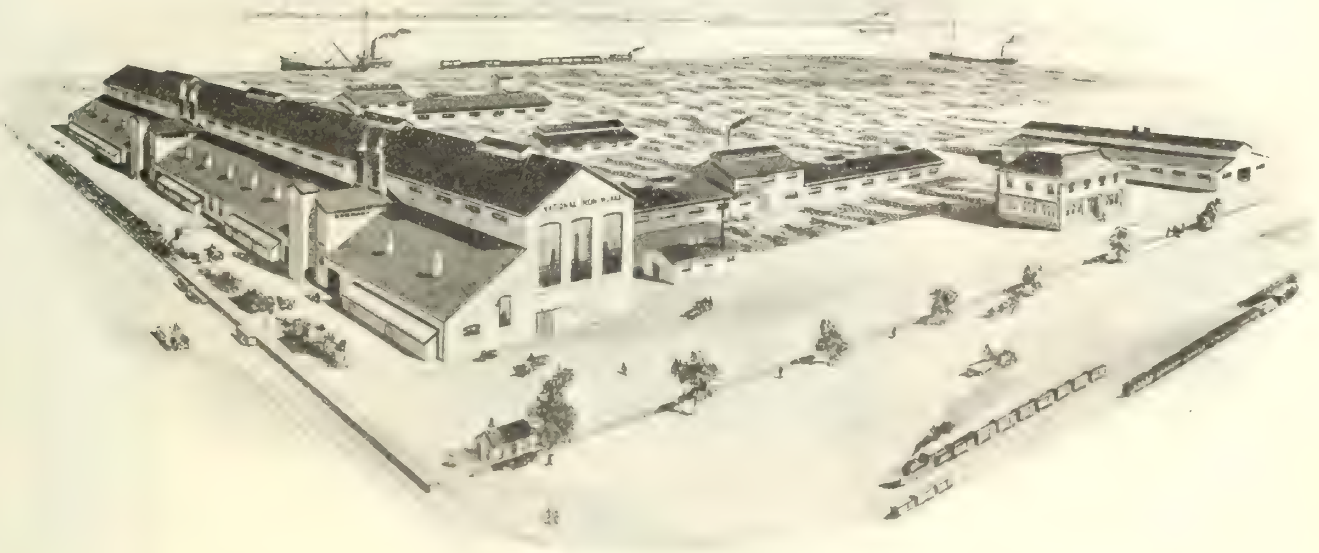
Mannesmann Tube Company

Limited

51 Victoria Square, - Montreal

The World's Standard for Water, Gas and Culvert

CAST IRON PIPE



Birds-eye View of Plant—28 Acres of Land. Over 3,000 Feet of Docks.

CAST IRON PIPE

5,000 tons of all sizes from 4 inches to 36 inches in stock for immediate Delivery

Let Us Figure on Your Requirements

NATIONAL IRON WORKS, LIMITED

Head Offices, Works and Docks, TORONTO

Doors
Base
Balusters
Columns

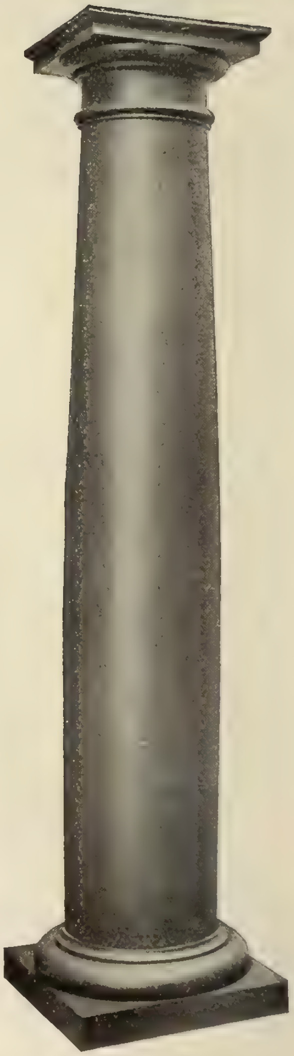
Sash
Trim
Turnings
Newels

IF you want high-class doors of good appearance and made of selected woods, we suggest Batts Limited as the place to get them. The workmanship in our doors is thorough and all woods are properly seasoned giving the doors long life.

In our columns the special "V" lock joint makes it impossible for them to crack or open.

Specify "Batts" doors, columns and trim.

Batts
Limited
Pacific Ave., Toronto



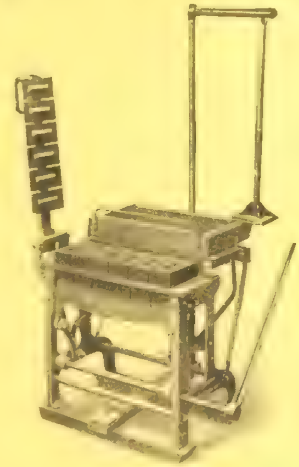
Wettlaufer Bro's
IMPROVED CONCRETE & ROAD MACHINERY

MIXERS
TILE MACHINES
CRUSHERS

HOISTS
BRICK MACHINES
PUMPS

Make Your Own Bricks
Right on the Job

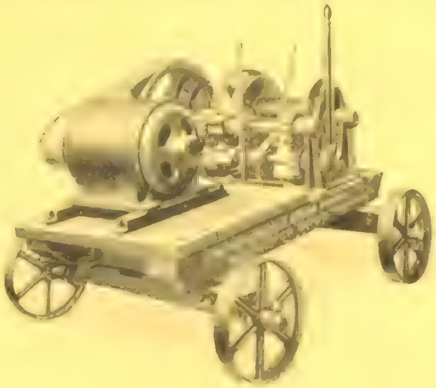
Hundreds of contractors are using this machine on account of the high price and scarcity of good brick.



This brick machine enables any contractor to manufacture all his own bricks at an approximate cost of $4.50 to $6.50 per 1,000.

The Wettlaufer New Hand Brick Machine
will enable you to make your own bricks right on the job. Saves time, labor and transportation. Your bricks when and where you want them—always right on the job. Makes a brick with a fine firm sharp edge. With two men the machine will manufacture up to 3,000 bricks per day.

The Wettlaufer Single Drum Hoist No. 1



The most useful and complete hoist for all building and contracting purposes.

Let us send you particulars of our Brick Machines and Hoists. Come and see them working. Continuous demonstration at

WETTLAUFER BROS., - - TORONTO

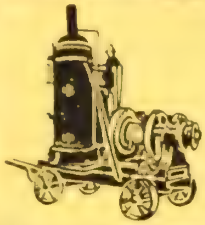
For List of Agents see next two pages

THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

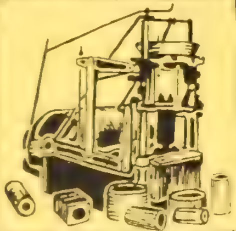
Wettlaufer

IMPROVED
AND ROAD

MIXERS



TILE MACHINES



CRUSHERS

WONDERS WILL

Wonders will never cease is RIGHT

Wettlaufer

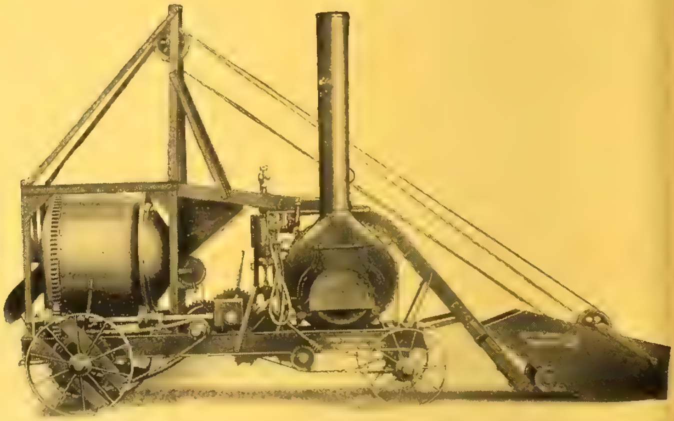
1913

Stationary Drum Traction

Stationary
Heartshaped Drum

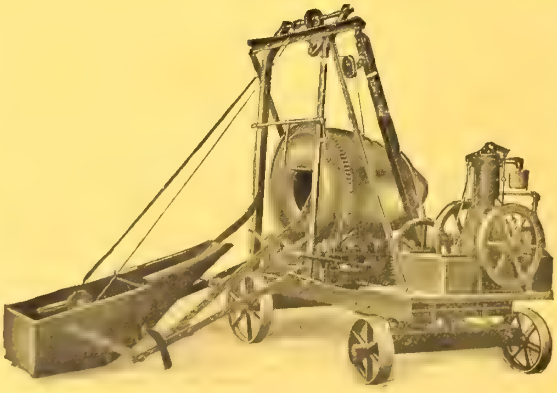
This drum throws the entire batch forward as soon as it enters the drum—blades throw the batch back — the Heart-shape drum throws it forward again.

Result — a quick and perfect mix. The batch is turned end for end at every revolution. A perfect mix is given to the batch ten seconds after it leaves the hopper. This gives double capacity over any mixer of the same size.



New 1913

Tilting Heartshape Drum Mixers and



Improved construction, all steel frame, semi-steel castings, automatic operation.

Send for our latest catalogue of our new 1913 Mixers. Come and see a practical demonstration any time at

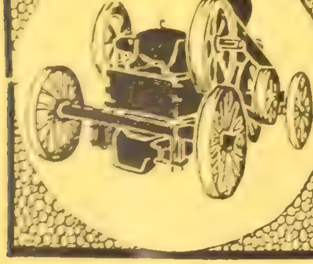
Wettlaufer

178 Spadina Avenue,
Factories; Mitchell, Ont.,

AGENCIES:

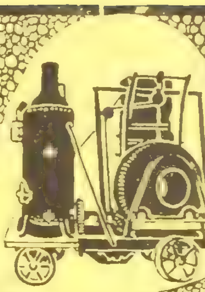
A. E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B. C. A. R. Williams Machinery Co., 15 Dock St., St. John, N. B.

Montreal Office and Warerooms:



THE FAMOUS
WETTLAUFER

Brothers CONCRETE MACHINERY

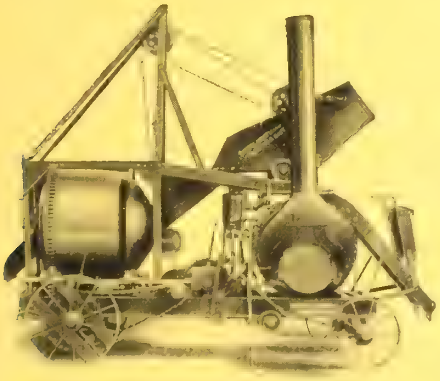


NEVER CEASE

when you consider the perfection of the

Heartshape

Model
Mixer with Horizontal Boiler



Horizontal Boiler

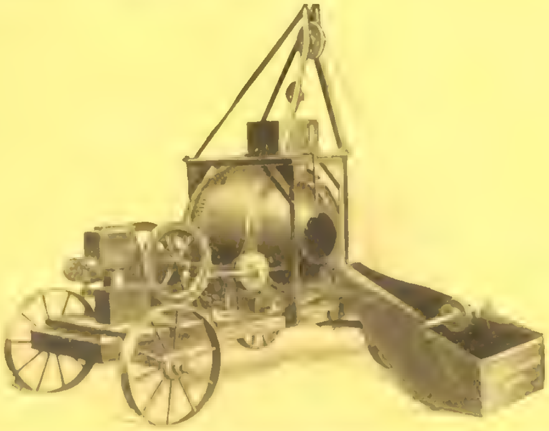
The position of this boiler gives an improved distribution of its weight, eliminating all over-balancing. This boiler also opens at both ends, with doors giving easy access to to flues for cleaning. The horizontal position also gives double heating surface.

Result—safety in moving. In any position will never turn over. A boiler always clean and giving proportionate economy in coal consumption and 50% increase of power owing to horizontal construction.

Models of Stationary Heartshape Drum Mixers

These mixers are made strong and are guaranteed to give absolute satisfaction in good work and long life.

Get our particulars and prices, learn how Wettlaufer Heartshape Mixers can make a saving all round for you in your contracting work.



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Toronto, Ontario
Buffalo, N. Y., Detroit, Mich.

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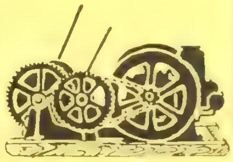
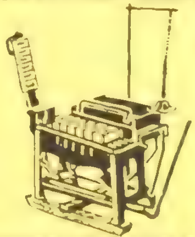
The Canadian British Engineering Co., Ltd., 321 Smith St. Winnipeg, Man. R. F. Mannell, 105 Cadogan Blk., Cal. The Hallman Machinery Co., [illegible] Alexander St., Vancouver, B.C. 316 Lagauchetiere St. W.

HOISTS

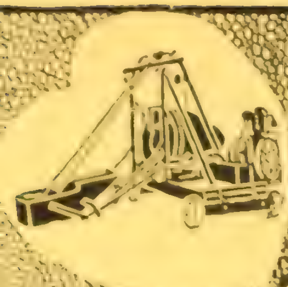


BRICK MACHINES



PUMPS

HEARTSHAPE MIXERS

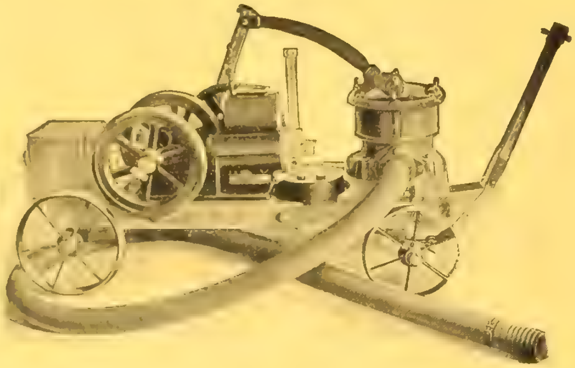


Wettlaufer Bro's
IMPROVED CONCRETE & ROAD MACHINERY

MIXERS

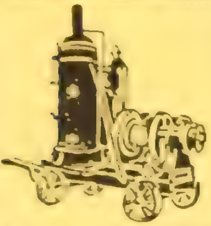
HOISTS

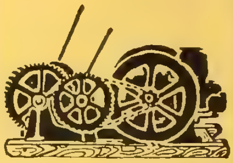
Wettlaufer Pumps and Mitchell Crushers



The Wettlaufer Pump

will pump at an average rate of 3000 gallons per hour.
It does more than the work of two men, at a cost of not more than 35c. a day. Save money and at the same time possess an up-to-date equipment—get a Wettlaufer pump.





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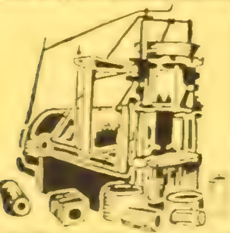
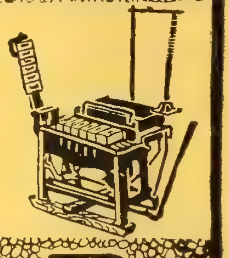
The Mitchell Crusher

will crush the hardest of material including field rock and boulders to any required sizes for general contracting purposes. Adaptable to all conditions.





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PUMPS

Send for new Catalogue of Pumps and Crushers and get our prices.
Write now or come and see these machines working any time at

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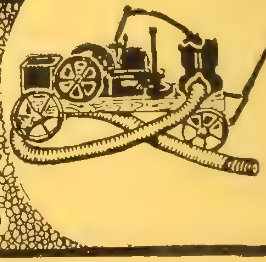
THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS



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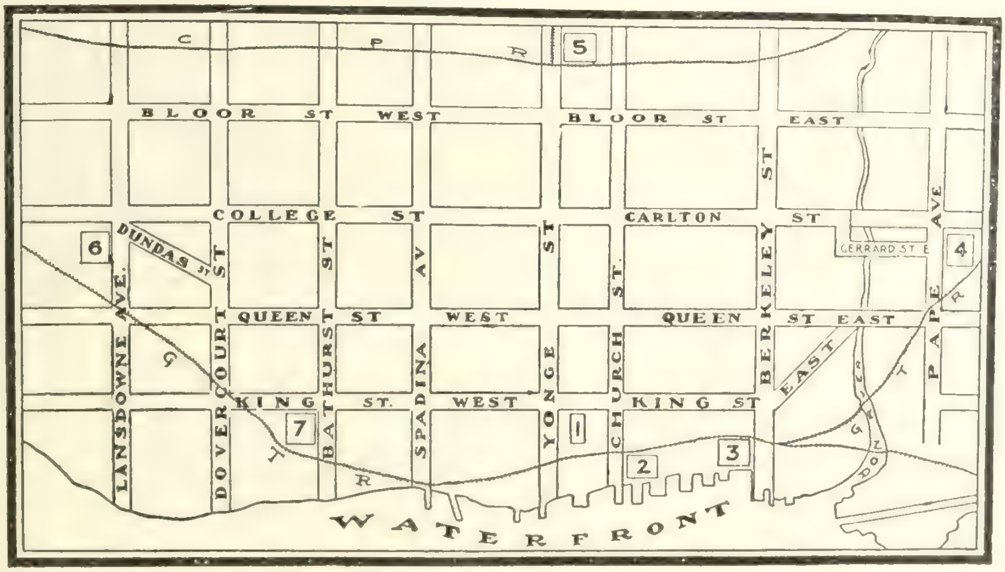

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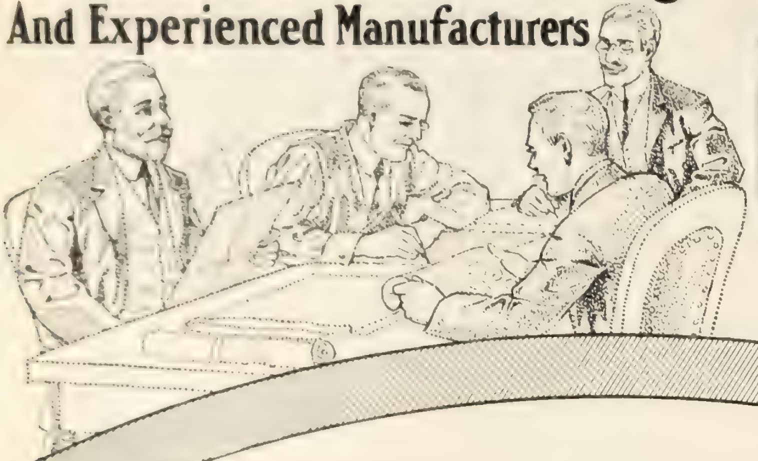

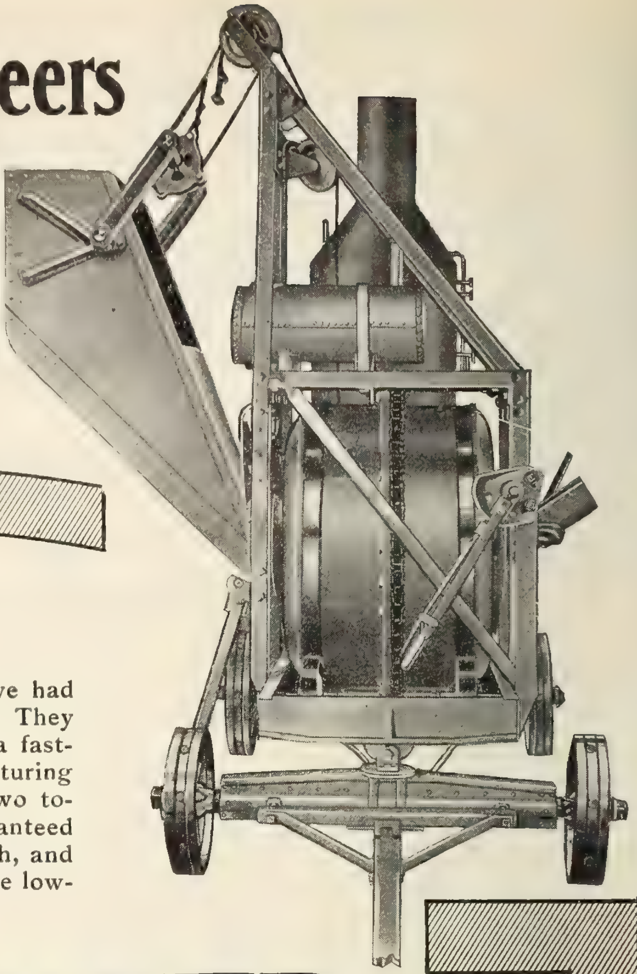

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THE men who designed the Oshkosh Mixer have had life-long experience in the big lines of work. They knew the grief a mixer gets at the hands of a fast-working crew, and they also knew the manufacturing business from the word "go." They put the two together and produced the Oshkosh—a mixer guaranteed to stand the hardest kind of usage without a flinch, and to deliver a perfect mix in double quick time, at the lowest possible cost.

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MIXER

Stands the Test of Service

Its Unusual Features:—Quadruple or Four-way mixing principle, that is, it turns, kneads, pours and flows four times to each drum revolution—efficient *Chain Drive*— Main Sprocket Drum Ring in sections; each instantly replaceable—*Discharge Lever* can be operated from either side of discharge spout. *Combination Drive* and *Hoist*—heavy reinforced channel steel *Frame*—thick semi-steel *Drum* rotated on extra large rollers; can be stopped or started full or empty—all parts standardized and fitted to interchange in the field with ordinary tools—high grade *Horizontal Steam Engine* made in our own factory; or gasoline or electric power as desired. Write for prices and folder to-day.

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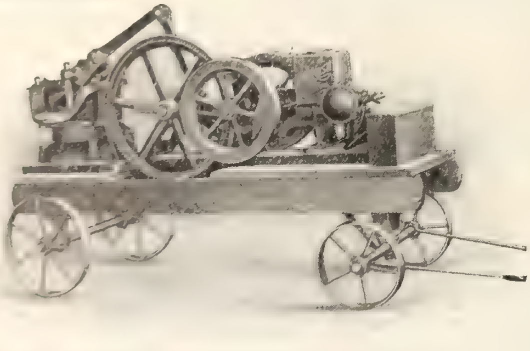

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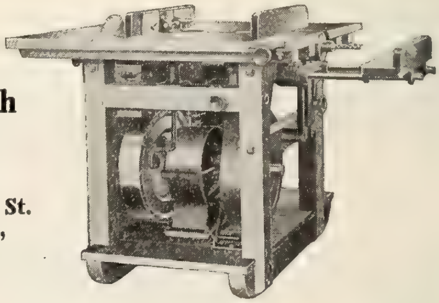

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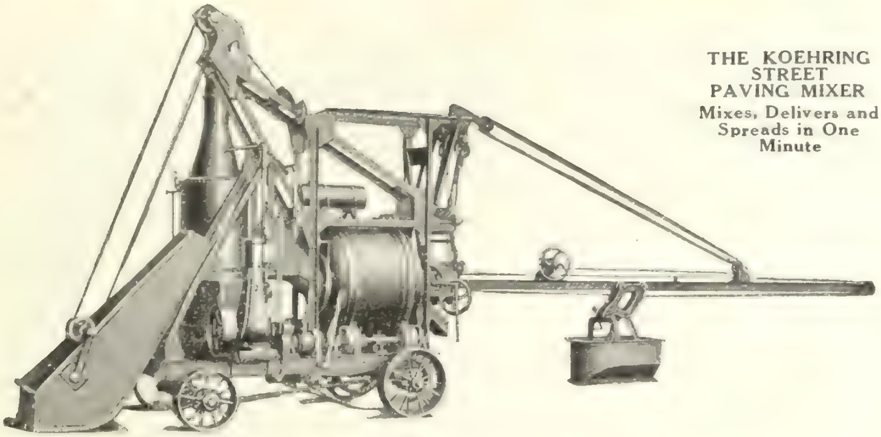
Bound To Win



THE KOEHRING STREET PAVING MIXER
Mixes, Delivers and Spreads in One Minute

KOEHRING Street Paving Mixer and HOT MIXER

Fastest—Most Thorough—Most Economical

An equipment that means to contractors lower bids, higher profits and new time records. Better concrete at less cost. A paving standard established that no contractor can equal with ordinary apparatus.

The KOEHRING is the most thorough and rapid mixer yet devised. The 3 in 1 motion mixes in three directions, insuring absolute uniformity of mixture—producing better concrete with less cement.

One man can operate our Street Paving Mixer—mix, deliver, spread and follow work. Think what this saving means.

KOEHRING apparatus is unequaled for building bitumen, rock asphalt, tar macadam or oil roads.

Built in various styles and capacities to meet any requirements.

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This is the equipment you need to succeed.

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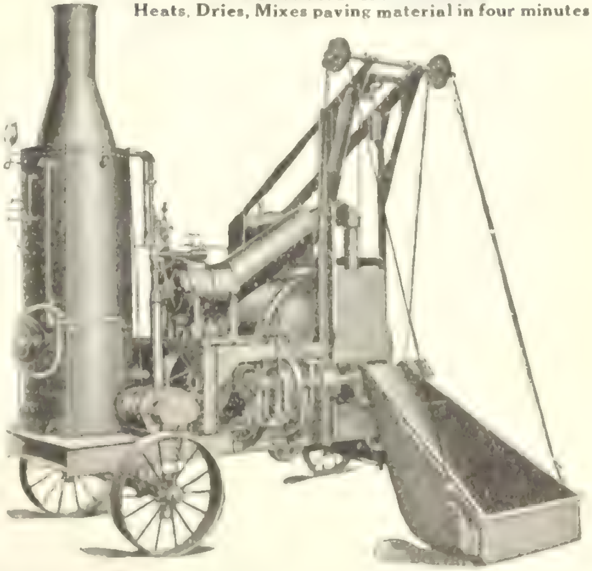
KOEHRING HOT MIXER
Heats, Dries, Mixes paving material in four minutes



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Forms Lintel to Support Brickwork. Presents Smooth Surfaces to Lead Smoke to Flue. Simplifies Mason's Work and Saves His Time. Provides Valve to Regulate Draft and Ventilation. Simply and Strongly Constructed. Cannot Get Out of Order. No Complicated Regulating Gear nor Piercing of Brickwork for Operating same.

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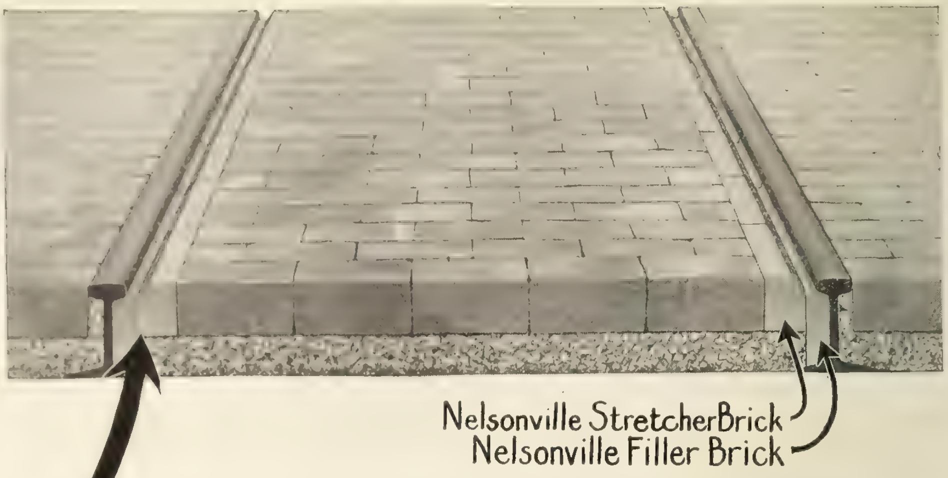

Shock Absorbers

for your pavement

Do you realize the tremendous vibration and strain constantly being communicated from the tracks of an electric railway to the paving when ordinary methods of paving with brick are used?

When you analyze the cause perhaps the reason why the paving heaves and bulges and breaks will not be so obscure.

When bricks are used—and if a good vitrified brick is used its economy is undisputed—the usual method has been to place "nose" bricks with one end under the ball of the rail, using long and short bricks alternately to break joints.

With such a crude method of construction, it is not hard to understand why every jar and jolt and movement of the rail is communicated to the paving.—**The rail is tied rigidly to it.**

Now glance again at the illustration and notice how

NELSONVILLE

Filler and Stretcher Brick

(Patented)

act as shock absorbers, protecting the pavement from the violent thrusts of the vibrating rail.

The result, as can readily be seen, is tremendously increased life of the pavement and avoidance of the many troubles common to brick paving laid in the ordinary way.

Furthermore, Nelsonville Filler and Stretcher Brick enable the use of the "T" rail without any of its disadvantages and giving it the advantage of the grooved rail.

Nelsonville brick construction makes it possible to lay the rail flush with the street surface.

By reason of the quality of Nelsonville clay, the method of making the brick and the patented construction, Nelsonville Filler and Stretcher Brick cannot be surpassed, if indeed equalled in economy.

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The Nelsonville Brick Company

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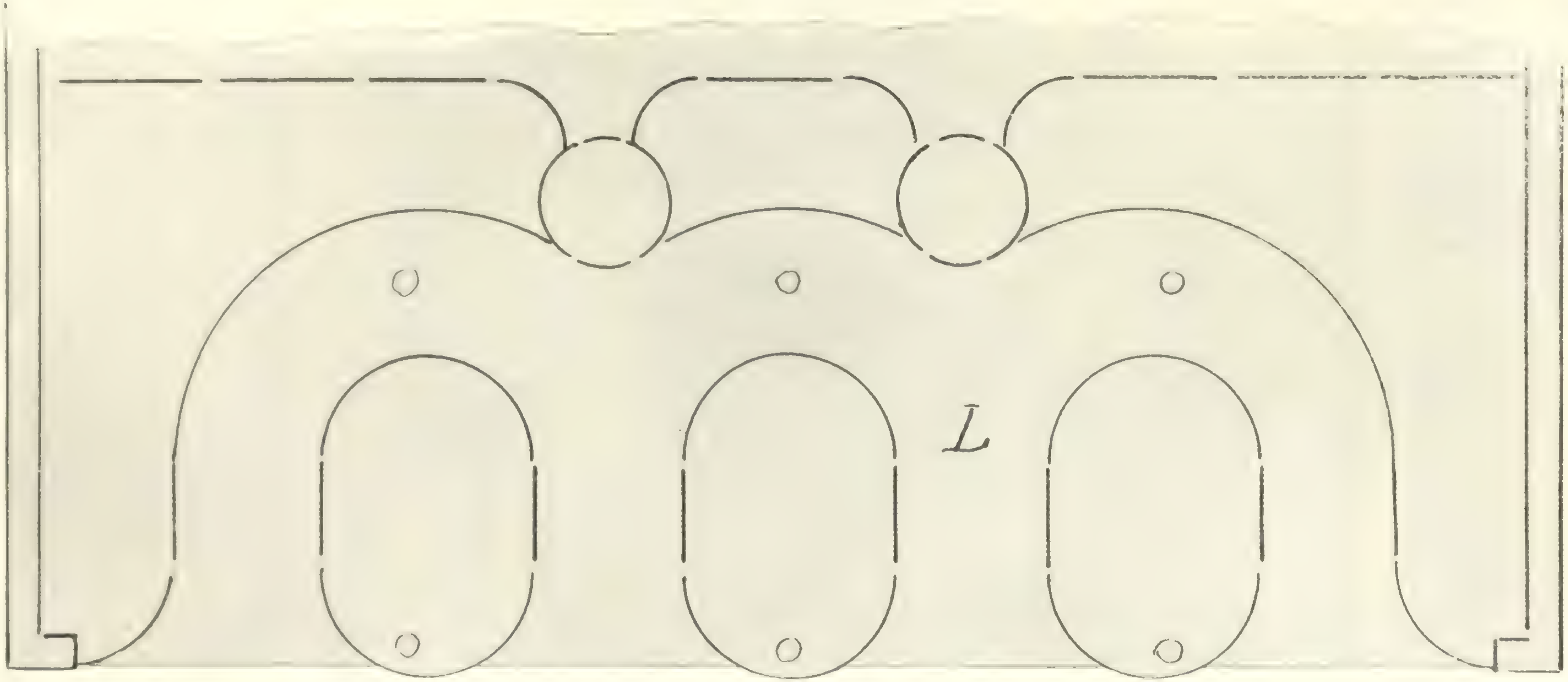

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As we are winding up our Georgian Bay logging operations, we shall sell off all our logging outfit, including

50 Pairs of Heavy Draught Horses (with or without harness)

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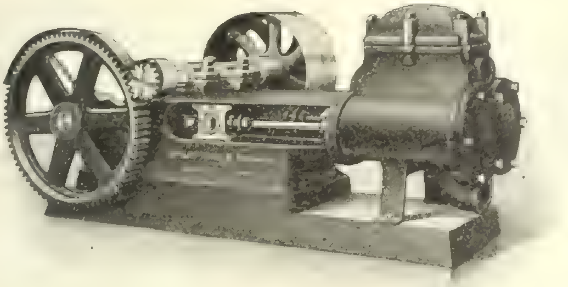

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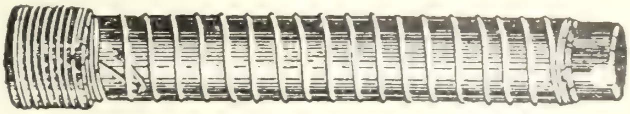

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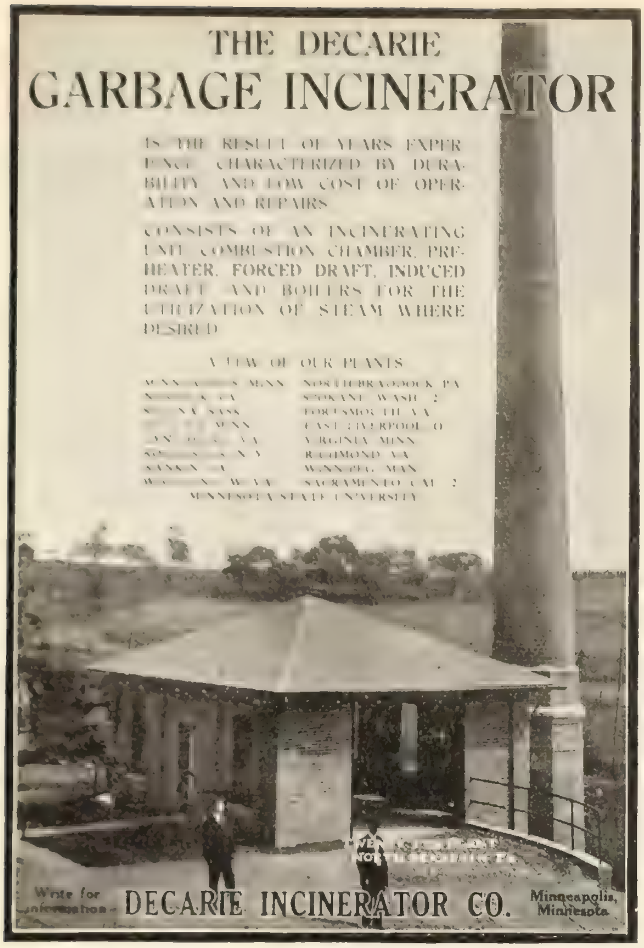

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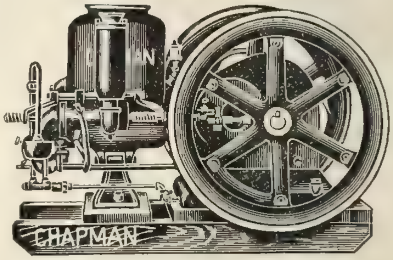

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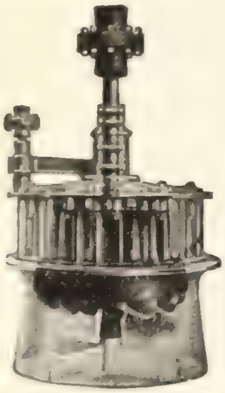

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Wherever a water wheel can be used, the Samson wheel will give complete satisfaction, and wherever efficiency is an important factor, there the Sampson wheel will give the best possible service, because it has shown as high percentages of efficiency as 89%. These results have never been surpassed in official tests by any turbine water wheel.

It is easily installed, and when in operation is easily controlled.

The Samson wheel is always sold on an absolute guarantee.

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Expert Builders of
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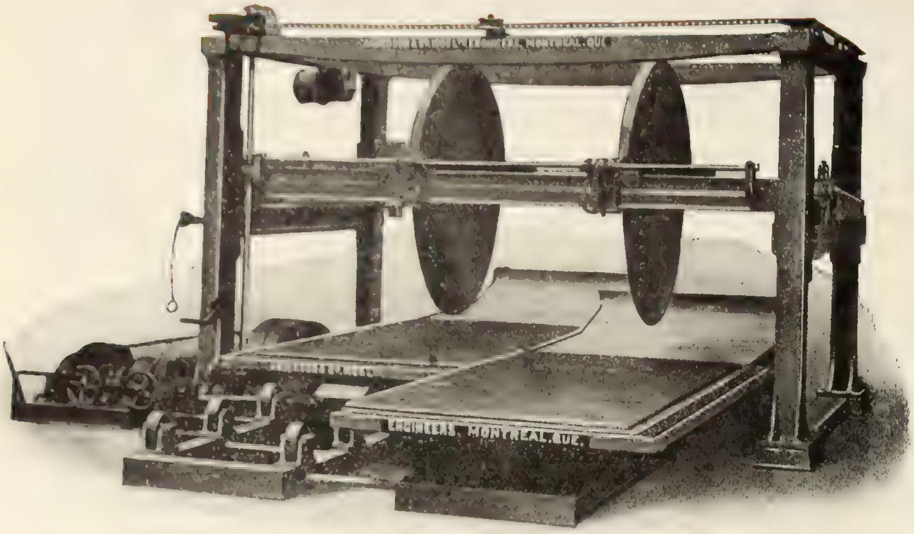

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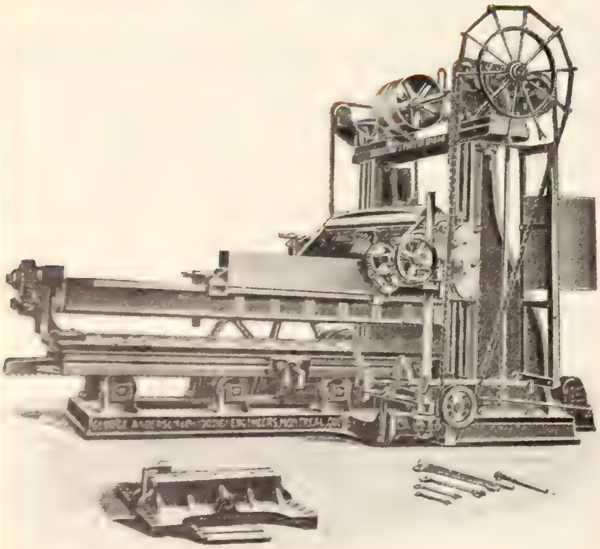

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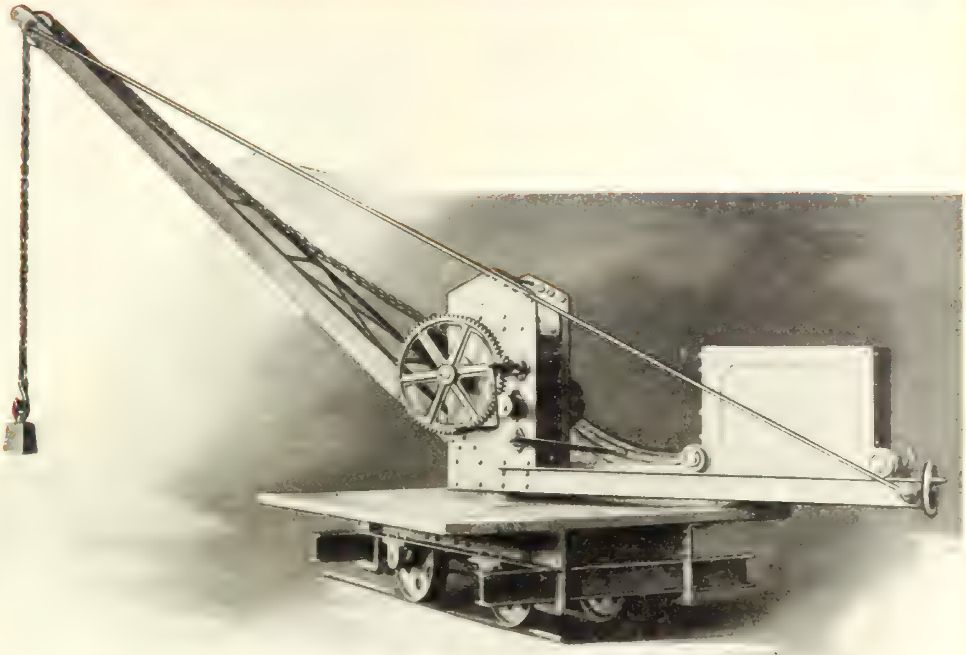

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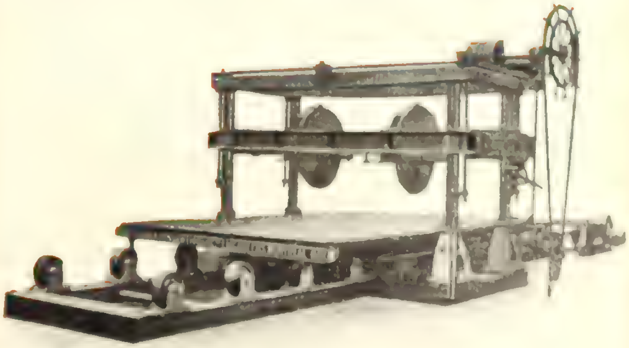

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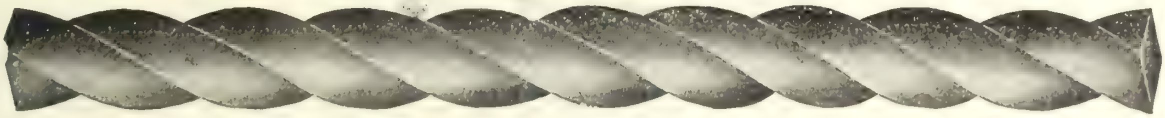

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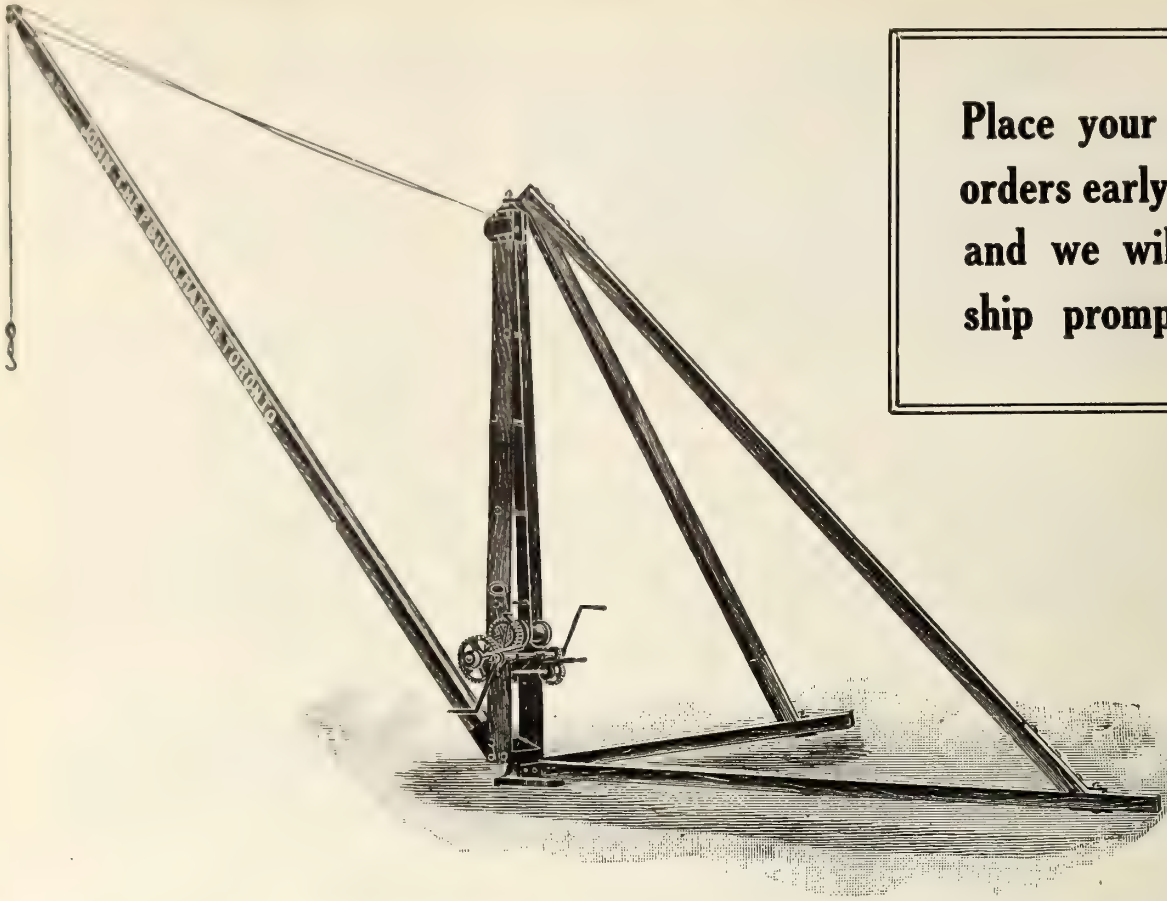
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NEW ELDER DEMPSTER DOCK AT MONTREAL where all the Eagle Brand Mexican Asphalt for Eastern Canada will be landed hereafter. This magnificent concrete and steel dock has just been completed.

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Salt Glazed and Vitrified

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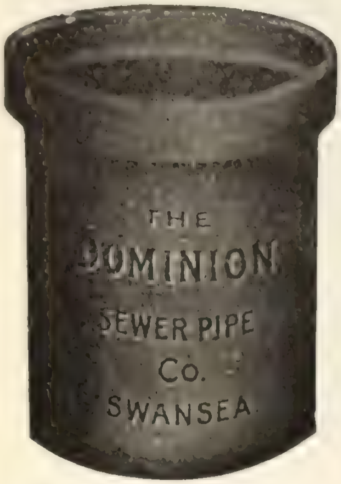

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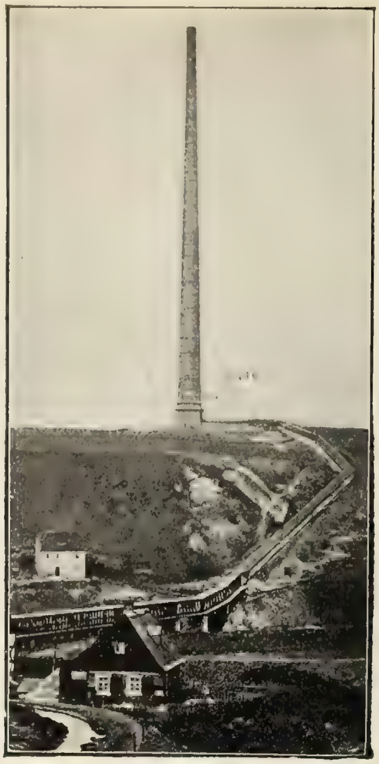
(The Independent Co.) **Limited**

SWANSEA (near Toronto)



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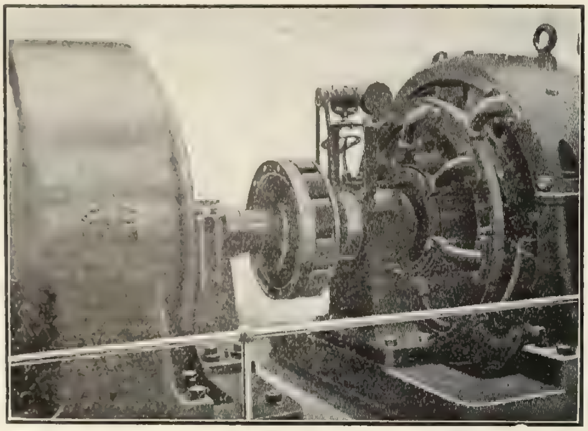

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It will pay you to investigate this shovel. Write for our catalog, C. R. It will explain the numerous features which make the Thew the most practical and economical machine of its kind on the market and will give you valuable information regarding cost of excavating.

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Non-Freezing and Fumeless

"BLASTERS' FRIEND"
Non-Freezing and Fumeless

These High Explosives are rapidly superseding nitro-glycerin dynamite as blasting agents for work requiring powerful explosives, not only because of the greater economy and safety due to the complete elimination of the dangers and expenses attending the thawing of explosives, as well as the expense and annoyance due to noxious fumes or gases causing disabling headaches, but largely to the fact that long experience in the use of our explosives, by many of the leading railroad construction contractors, quarrying, mining and other concerns, has proven that blasting operations of any kind whatever can be carried on with far greater economy than was possible four or five years ago, when our Non-Freezing, Fumeless High Explosives were first placed on the market.

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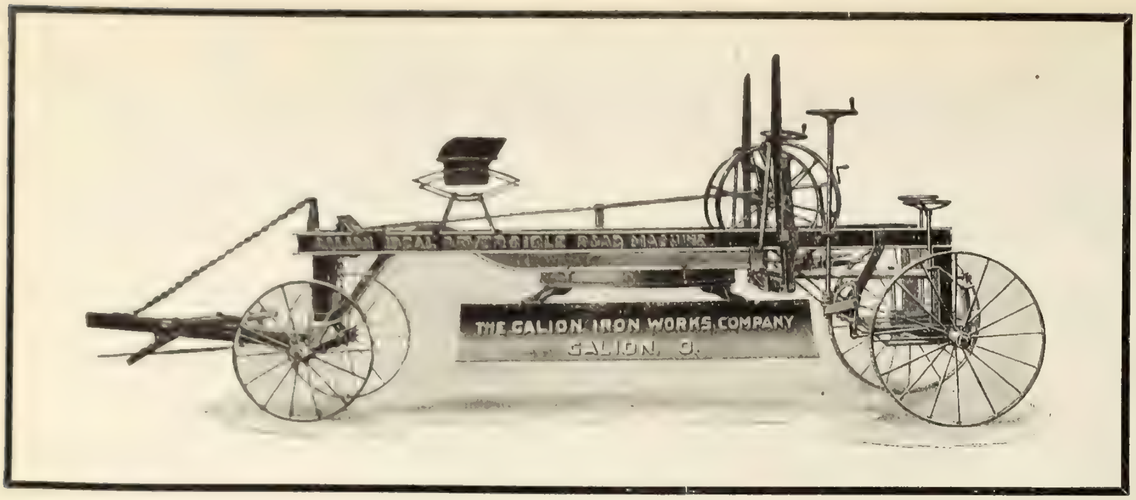
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THE GALION IRON WORKS COMPANY
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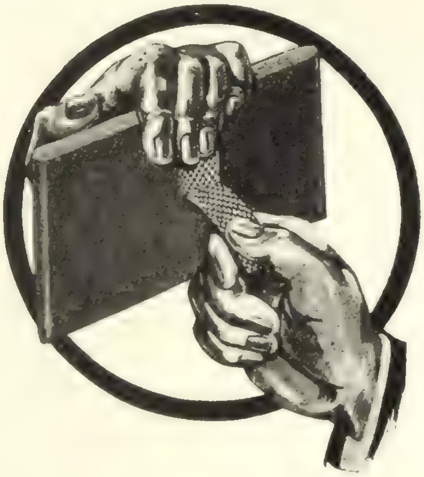
GOODYEAR



Try pulling this Belt apart

That will give you some idea of the enormous strength built into Goodyear Belts. Not an ounce of untested rubber is used, not a roll of untested duck. Each finished Belt is inspected before shipping *to make sure* that it will stand the *wear* and keep *pliable.*

The Goodyear system of Belt making is calculated to give the greatest efficiency in practical Belt Service.

A close, clinging grip of the pulleys—absolutely non-slipping. Goodyear Rubber Belting gives this cohesive contact because of its yielding rubber surface, and the practical result is an immense saving of power.

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Enormous strength. The union of carefully tested hard-fibre cotton with tenacious and elastic rubber "friction"—compressed to make the plies practically inseparable—gives a combination of prodigious strength. A Goodyear Rubber Belt is as nearly unbreakable as any Belt can be.

Long Life. The duck or fabric of Goodyear Belting cannot be reached by water, or anything else that would set up rot and destroy the Belt. A Goodyear Belt renders long and efficient service.

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GOODYEAR

Rubber Belting

Factory Superintendents specify Goodyear Belting. **They are satisfied that Goodyear Rubber Belting puts the plant on a power-saving basis. Write for free Book on the choice of a belt.**

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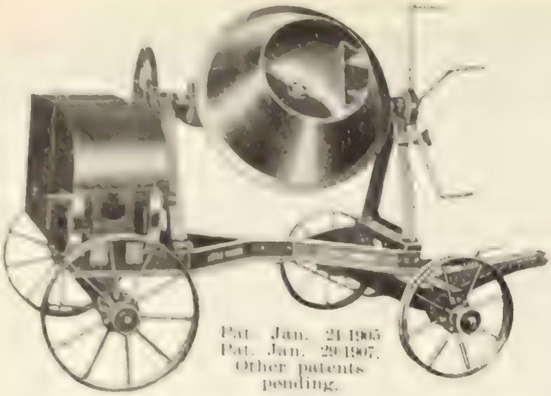

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that needs this mixer if you're wise to profits—the mixer that made big profits for hundreds of contractors in the States last year—that pays for itself in less than 20 days—that is sold under a "Man to Man" proposition of TEN DAYS' FREE TRIAL (and even this yields a profit)—a mixer that does the work of machines for which you'd pay three times the price—that is absolutely unapproached in profit making capacity by any mixer of similar size in the world.

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"THE SMALL JOB MONEY-MAKER"

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FOR HEAVY WORK THE LITTLE WONDER "TEN"

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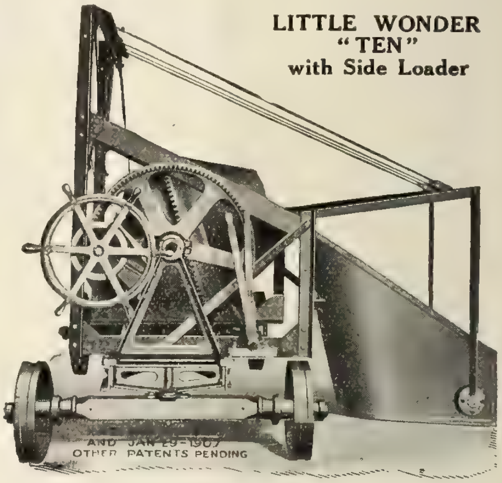
"TEN"
with Side Loader



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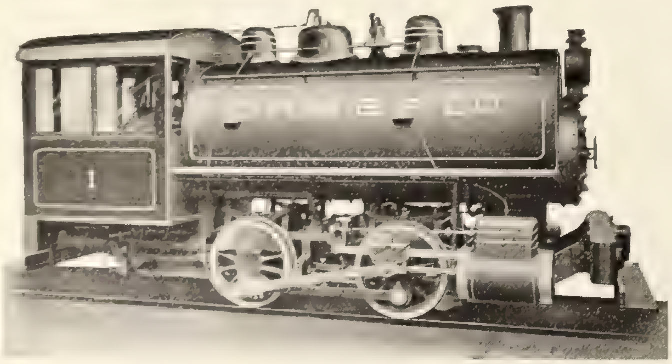

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Our locomotives embody the best construction and are sturdily built. They are simple in design, and all wearing parts are accessible for easy repairs.

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18 Years

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Three Section Incinerator—Type No. 2

Sewage and Garbage Incinerators

In Standard Ideal Incinerators the accumulation of the matter—both solid and liquid—is absolutely sanitary and non-infectious. The system of Incineration is complete—the solid matter being reduced to a small ash and the liquids completely evaporated.

It is important to note that in the latter process the system of drafts is arranged so that the fumes and vapors arising from the accumulation must pass through the fire before reaching the open air. This obviates all obnoxious odours.

The United States Government finally selected this type for the disposal of toilet refuse in its military camps and elsewhere, after trying every other apparatus on the market.

Standard Ideal Incinerators are made in two types:

TYPE No. 1 is intended for the use of 10 persons daily.

TYPE No. 2 is sectional; one section alone having a capacity for 25 persons daily. The addition of extra sections increases their capacity proportionately.

Write for booklet
"INCINERATION AND INCINERATORS.

The Standard Ideal Company Ltd.
PORT HOPE, ONTARIO
Branches: WINNIPEG TORONTO MONTREAL VANCOUVER

ESTABLISHED 1886

Contract Record and Engineering Review

Published Each Wednesday by

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Vol. 28 April 30, 1913 **No. 18**

The British Manufacturer

It is gratifying to learn from the Canadian Chamber of Commerce in London that a number of municipalities and other purchasing bodies in Canada have arranged to furnish the Chamber with the earliest possible notice of any appropriation which may be made for constructional and other purposes, where it is practicable for the British manufacturer to compete. For some time past we have been devoting a good deal of attention to this matter, feeling confident that the British manufacturer should be getting more business here. Inadequate time allowance on the part of Canadian towns and cities has cost many thousands of dollars—we might say millions, for this short-sighted policy has been in effect years. Enthusiasm in the matter of promoting the interests of home industries has its place, but the constructional field of Canada is extending its ramifications so far that a narrow aspect is no longer possible.

It were commendable on our part if we strove to encourage the Old Country manufacturer with the sentimental object alone of encouraging trade within the Empire, but this is a matter into which dollars and cents enter, as well as sentiment. In many lines of manufacture in the municipal field, the products of the English factory are unexcelled. If, then, we debar the best from our competitions and pay the same price for the second-best, we are cutting off our noses and paying for the privilege of doing so.

Another way of looking at the question, apart from the objections that might be adduced on behalf of the ratepayers of this country, is that billions of British capital are invested in Canada and that in mutual interest we must turn trade in the direction of the Old Country when opportunity offers.

Our excellent neighbors to the south are more favored geographically than our own people across the seas. From this fact they must continue to reap a substantial advantage for a number of years. We advocate no policy of discrimination, but we do contend most emphatically that notice of projected works should reach tenderers in the United States and in London simultaneously. There have been many instances where advance information has been wired to United States concerns while printed notices have been plowing their way across the Atlantic on an eight or ten-day journey to Old Country firms. As an illustration, there was the Toronto subway proposition upon which a number of large United States firms submitted tenders and not one British firm, owing to lack of time. And England has more experience in tube construction than the combined countries on this side.

Complaint is made occasionally that England is not sufficiently alive to the opportunities for trade afforded by Canada. Is this not due in a measure to the inadequate publicity that Canada has given her great constructional enterprises? Thousands of dollars judiciously expended by our municipalities in this direction would be money well spent. Canada's greatest needs are more people and more capital, and it is to England that we must turn first in our own interest.

We contend once more that the best and only policy of Canadian municipalities is to plan ahead, so as to give adequate notice of requirements for public works, municipal and other supplies, and to advertise well in advance in the principal manufacturing centres of the Kingdom.

We want England to know more of the constructional harvest that is now ripening: and we want more British competition, being fully persuaded that competition is the essence of progress.

New Building By-Law of the City of Toronto

Now that the new building by-law of the city of Toronto has been finally adopted by the City Council and further improvement for some time is out of the question, it is of interest to note in what respects the new ordinance differs from the old and what has been the result of the two years and a half of work on the part of the Citizens' Committee.

It should perhaps be stated for the benefit of some of our readers that this organization, which consisted of some thirty odd representatives of the various technical organizations of the city, with a sprinkling of business men, began to investigate building conditions in Toronto in the fall of 1910 and after an exhaustive study of the old by-law made a series of comprehensive recommendations, in the form of a memorial, to the Mayor, the Board of Control and the City Architect, in May, 1911. The matter of revision was referred to the City Architect and it is only a few days ago that copies of the new by-law, minus the index, became available to the public.

The improvements in the by-law relate chiefly to structural requirements, although including a number of changes of a general character, such, for example, as certain desirable restrictions respecting apartment houses. Some of the improvements effected are the adoption of a fairly reasonable specification for the design of steel grillage footings; an increase in the formerly absurd allowable pressures on brickwork; higher permissible stresses on plate girders; a greatly improved formula for steel columns; some relaxation of the excessively severe requirements for wooden columns; a more precise specification for wind pressure on sloping roofs; rational floor loads for garages; an improved specification for reinforced concrete construction; and the insertion of specifications for hollow tile construction and for radial fire brick chimneys.

But while improvement has been made in the old ordinance, there is need of a much more thorough revision than has been given it in the present instance. Perhaps the greatest factor in preventing the adoption of a thoroughly up-to-date ordinance is the extreme timidity of the City Architect's Department in all its actions. It is well to be cautious and conservative in matters affecting safety, but there is a limit to caution beyond which it becomes a ridiculous burden to the community. If an engineer or an architect, in the attempt to safeguard himself, require far more material to be put in a structure than any other responsible and competent engineer or architect would require, his personal caution is costing the people who employ him far too much and he should be replaced by someone with less conservatism and more common-sense. That this condition of affairs exists to some extent in the City Architect's Department no one qualified to speak will deny.

If a rational and fully modern by-law is to be obtained for the city, steps should be taken at once to complete the revision, which has been scarcely more than inaugurated. Building by-laws, as is well known, are always obsolete, from the rapid changing of practice and constructional conditions, and the best that can be done is to keep them reasonably up-to-date. If it takes two years to make the next revision, it is none too soon to start again, for by the time another by-law is ready it will be sorely needed. It should be pointed out in this connection, also, that the next revision should be made, not by one person, but by several, working as a commission. The building by-laws of modern cities are much too complicated and con-

The Moving Finger writes;
And, having writ, moves on.

Robbed of their context, the above lines are particularly appropriate above a few prefatory remarks concerning the Annual Number of the Contract Record and Engineering Review in the Year of Grace, Nineteen Hundred and Thirteen. It would appear strange that the pessimistic utterance of Omar, coming down through the ages, should apply to Canadian events in our day, but they do—for the reason that they suggest continuity of effort. We write: and so long as we write about anything connected with this great Dominion, we must "move on." If we hang back, or remain stationary, we are no longer the "Moving Finger." In all spheres of endeavor other than the constructional, we should have a better chance of survival if we failed to move with the times. And so, year by year we view with little trepidation the task of presenting an Annual Number that marks some improvement on its immediate predecessor. There is no trepidation where there is no danger. In a country like Canada, where the very highways and hedges are teeming with opportunity, progress is in the natural order of things. On every hand Canada is growing greater and stronger each year. It were surely a remarkable phenomenon for the tree to flourish and the branches to decay. Canada flourishes; we flourish. In the natural life of Canada the constructional field of endeavor is one of the main arteries. Witness the expenditure of twenty-seven and a half million dollars in building last year by the city of Toronto or the expenditure of some two hundred millions by the leading cities. Witness last year's activity of the Canadian Pacific, the Canadian Northern and the Grand Trunk Pacific railways, whose combined work represented nearly two thousand miles of trackage, built at a cost of some thirty million dollars. Witness the estimate of forty-one million dollars of those same railroads for new construction work in 1913. Witness the expenditures of millions by the cities and towns in municipal work and by the provinces in road work. Witness the fact that the average concern—manufacturing or otherwise—identified with constructional operations, outgrows its facilities in the short period of three years. Witness all these things and find no cause for gratification, no inspiration for greater effort, and one might well seek a solace in the back woods, removed from suggestions of activity and progress. The opportunity is ours; let us exult in it. The tide is at the flood; let us not miss it.

That these are no commonplaces of editorial diction is substantiated by the announcements of some three hundred enterprising advertisers in this issue. We are safe in the assertion that a careful study of these announcements will redound to the advantage of him who reads. The articles presented in the editorial pages are written by experts in their respective fields who require no introduction to the constructional public.

cern far too many matters for any one man to be competent to write an authoritative specification for everything mentioned in them.

Some of the matters in greatest need of further attention are the excessively severe fireproofing requirements for exterior columns; the irrational specification for curtain walls in the lower storeys of high buildings; the rules for the reduction of live load on columns in the buildings; the rules for number of piles in wall foundations; the still severe specification for plate girders, wooden columns, floor loads and certain features of reinforced concrete construction.

While many of the excellent recommendations of the Citizens' Committee were rejected by the Property Committee and the City Council, due to an exaggerated notion of the necessity of confidence in a department head, the labors of the Committtee have resulted in a very great improvement in the by-law, which, it is believed would never have been brought about without outside pressure being brought to bear on the City Architect's Department.

It is open to question whether the self-sacrificing work and investigations of the Citizens' Committee have been adequately recognized. Certainly the Committee has not been over-burdened with the appreciation of the city authorities, although this is not surprising when one is confronted on the one hand with a body of expert technical men and on the other with a heterogeneous mass of ignorant politicians. For our own part we regard the work of this Committee as a historical achievement and we take the opportunity of making this permanent record of the membership of the Committee, paying a especial tribute to the monumental work of the secretary, Mr. C. R. Young. The original members of the Citizens' Committee were: Messrs. W. F. Evans, A. H. Gregg, A. H. Harkness, W. Ford Howland, T. Harry Mace, J. Morrow Oxley, John A. Pearson, W. E. Wagner, A. F. Wells and C. R. Young (Secretary).

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WE are sorry to learn that the erection of a skyscraper of twenty storeys has been sanctioned in Toronto, says The Builder, of London, Eng. We hope it may prove to be the exception which proves the rule, but we have fears that this may not prove to be the case. "The evil that men do lives after them," and in architecture this applies as in life. In the case of New York the congestion occasioned by the exceptional configuration of Manhattan Island, and the congestion of traffic produced thereby at its southern end, gives a practical reason which partially explains and excuses the erection of these architectural blemishes to a city, but no such reasons obtain in the great majority of the newer towns of America and the colonies.

* * *

THE New York Times quotes from a report made by Herr Quedefeld, who is attached to the German Consulate-General in New York, and who is an expert in building engineering, on the advisability of introducing the skyscraper into Germany. The report is a convincing condemnation of high buildings and as such deserves notice. Although skyscrapers may be themselves incombustible, they are often packed with combustible material where fire may obtain plenty of nourishment. Nor is this all; the cellars which contain the boilers and engine plant are packed with immense quantities of fuel and packing-cases, and very frequently gasoline and petroleum. As soonas a fire arises the elevator shafts are converted into immense chimneys, the elevators put out of action, and the sole means of escape is frequently limited to staircases of small width, often winding round the elevators, and therefore totally useless. In addition to all these dangers as the New York Fire Department can only throw up water as high as the seventh storey, or a height of 91 ft., the remainder of the building can only be served from a water tank placed on top, which may be empty. In spite of the fact that outside staircases and balconies are now being made compulsory, Herr Quedefeld concludes that the dangers attendant on this form of building are too overwhelming to render its sanction in Germany reasonable.

* * *

AN article by Professor Watson, of the University of Illinois, in the Engineering Record, deals at some length with the relation of air currents to the acoustical properties of auditoriums, and applies the main conclusions of the author to ventilating systems. From the experiments conducted by Jacques, Tyndall, Sabine, and the author, it is clear that sound waves impinging on the boundary between two gases suffer reflection and refraction to an extent governed mainly by the difference between the temperature of the gases, or the amount of moisture contained, or upon the different nature of the gases. Many of the common effects of currents on sound may be explained by these considerations. It is shown also that haphazard air currents in an auditorium make the hearing confused and indistinct. In applying his conclusions to systems of warming and ventilating auditoriums the author recommends that stoves, radiators, and hot air registers should always be placed near the walls so that no currents of hot air may come between the speaker and his auditors, and for the same reason it is desirable in theatres to substitute electric lamps for gas lights in the footlights. Ventilation has practically no effect on the acoustics of a building unless the air currents are haphazard. It is not to be concluded that poor acoustics can be greatly improved by a ventilation system, but it is clear that poor acoustics may be made worse by unsteady currents of air with many boundaries between hot and cold layers.

* * *

THE important features of the cement industry in the Dominion during 1912 were an increase of over 26 per cent. in the domestic production of Portland cement, an increase of over 116 per cent. in imports (due chiefly to the 50 per cent. reduction in the tariff during the period June 12th to October 31st) and an increase of over 34 per cent. in total domestic consumption. Canadian mills supplied 83.2 per cent. of the consumption, as against 90 per cent. in 1911. The total quantity of Portland cement made in Canada in 1912 was approximately 7,169,184 barrels. The quantity of Canadian cement sold or used was 7,120,787 barrels, valued at the mills at $9,083,216, or an average of $1.27½ per barrel. The total imports of cement were 5,020,446 cwt., equivalent to 1,434,413 barrels of 350 pounds each, and valued at $1,969,529, or an average of $1.37 per barrel. The total consumption of Portland cement, therefore, neglecting a small export of Canadian cement, was approximately [illegible] barrels.

Inoffensive Collection and Disposal of Sewage

By Rudolph Hering, D.Sc., Consulting Engineer, New York City

ENGLAND is the country where the art of sewage collection and disposal was first practically developed on a large scale, where the chief principles of design and construction were first formulated, and where the longest experience in this branch of municipal engineering has been gained. Naturally, therefore we have looked to that country for the best and most reliable information on the subject, which during the last fifty years has been strongly impressed upon all large cities of the world. More recently a few other countries have taken a leading hand. To-day, we may say that the development of the art has reached a point where it is practicable to collect and dispose of the sewage of cities in a manner not only to guard our health, but also to prevent all nuisance.

Dr. Rudolph Hering.

The health question has been solved by the knowledge that pathogenic bacteria can be eliminated from sewage and by the discovery of the practical ways of accomplishing this result. The nuisance question has been solved by the knowledge that the offence is caused by bacteria of putrefaction and by the discovery of the practical means of preventing their excessive development in sewage. The latter discovery is comparatively recent and important, because the opinion of the average person is more actively influenced by the perception of an offensive smell than by the insensible existence or non-existence of pathogenic bacteria in his environment.

To simplify a general discussion of the present sewage question, it is convenient to divide it into two parts and to mention the facts relating first to Sewage Collection and secondly to Sewage Disposal.

Sewage Collection

Formerly, sewage receptacles were placed outside of the walls of buildings, fearing trouble from a location inside. To-day, we have closets adjoining our bedrooms, and Winslow's investigations have proven the practical absence of pathogenic bacteria in the air of soil pipes.

Formerly, house sewers were trapped against the public sewers. To-day, greater advantages are recognized by omitting the main trap and effecting a good ventilation from the public sewer through the house sewer to above the roof.

The reason for these changes lies in the gradual recognition of the value of keeping sewer pipes clean, both by abundant air flushing and by water flushing. This cleanliness also helps the sewage to be carried away in a fresh state, in which condition it has no offensive odor.

The same results may be reached also in public sewers. By ample and natural ventilation and artificial flushing, the sewers in the streets can be kept clean and neither become dangerous to health nor emit offensive odors. The best and most extensive examples of such sewers are on the European Continent and to some extent also in England and on this side of the Atlantic.

The sick and death rates among sewer cleaners in Europe are no greater than nor even as great as they are among the followers of other occupations. In a number of cities it is customary to take visitors into and down the sewers, as in Paris, Frankfurt, Weisbaden, Cologne, Hamburg and still other cities. The larger sewers are generally lighted by electricity to make cleaning easier and better.

In order that ventilation and flushing may secure the inoffensive collection of sewage, sewers must be specially designed and built to effect these ends. The essential conditions are, to maintain sufficient and constant velocities, to allow no eddies and objectionable retardation of flow, and to give the surface upon which the sewage flows, the highest practicable degree of smoothness and thereby to prevent retention of solid matter.

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*Dr. Rudolph Hering is too well known throughout the whole American continent to require a formal introduction at our hands. He was born in Philadelphia in 1847 and studied engineering in Dresden from 1860 to 1867. His first practical work was on Prospect Park, Brooklyn, in 1868, and later on Fairmount Park, Philadelphia. In 1872 he was engaged in the exploration of Yellowstone Park for the U. S. Geological Survey. For some eight years he was assistant to the City Engineer of Philadelphia. In 1881 he was commissioned to Europe by the United States Government to report on sewerage systems. Since 1881 he has been engaged in private practice on works of water supply and purification, sewerage and sewage purification, and refuse collection and disposal. In the above fields Dr. Hering has been retained by most of the large United States cities. His activities have also taken him far afield; he was engaged on the sewerage and water supply of Honolulu; and the city of Santos, Brazil, retained him in connection with its water supply, sewerage and refuse disposal. In Canada he has reported on the sewerage and water supply of St. Johns; water supply of Montreal; water supply, sewerage and refuse disposal, Toronto; sewerage works at Ottawa; water supply at Winnipeg, and sewerage works at Victoria.

We have abundant experience in civilized countries to indicate that in practice these conditions can be readily secured, and that the desired results follow in all cases.

There is, however, a limit beyond which the case is less simple. Sewage after a few hours exposure to the air, particularly in warm weather, becomes foul. The cause of this foulness is the exhaustion of oxygen from the sewage, started by the process of aerobic decomposition and finished by the process of anaerobic putrefaction. There is no practicable way within the sewers of replenishing, in sufficient amounts, the oxygen lost from the sewage.

The best procedure to overcome this defect is to remove from the sewage, as soon as practicable, as much of the suspended matter as possible which consumes the oxygen.

Sewage, when it leaves the points of origin, at first contains very little dissolved organic matter. The dissolving process constantly increases so that in an average sized city the sewage at the outfall contains about as much organic matter in solution as in suspension. Under such conditions the removal of a large part of the suspended matter may be practicable by the interposition of double-decked sedimentation basins placed along the sewer. The liquid will then pass on through the upper basin in a better condition than if it still carried all the suspended matter, and will postpone the putrefaction of its remaining dissolved matter because of the larger amount of oxygen left available for it. For long intercepting or outfall sewers this interception of solid matter on the way may sometimes be of considerable value in maintaining the sewage for a longer time in a fresh condition. The intercepted and deposited suspended matter can be left to decompose inoffensively in the lower basin by the Imhoff method of sludge digestion, to be described below, and be removed in a wholly unobjectionable condition.

From what has been said above, and reinforced by sufficient actual experience on both sides of the Atlantic, it is my firm belief that in every city we can collect the sewage from the houses and deliver it to an outfall without producing any offence along the entire route, first, by proper design and building, and secondly, by faithful cleaning.

Sewage Disposal

What to do with sewage after the sewers have carried it out of town offers a more complex problem, the greater complexity being due to the number of ways in which we may dispose of the sewage. These ways may for the present purpose be grouped under two general headings. The first and most common one is that where a sufficiently large body of water is available for receiving the discharged sewage, and which we usually call the dilution method of disposal. The other one is a treatment on land in ways which depend chiefly upon the character and area of the available territory. Here, too, we must consider both health and nuisance questions.

Disposal by Dilution

As our exhalations into the air can be satisfactorily disposed of by dilution, so can sewage be satisfactorily disposed of in large bodies of moving water, so long as this contains a sufficiently large amount of dissolved oxygen.

Pathogenic bacteria are gradually, though sometimes quite slowly, starved and perish in fairly clean and well oxygenated water. The less organic matter the water holds the more rapid will be their disappearance. On the other hand bacteria are attracted by and firmly adhere to the particles of suspended solid and colloidal matter, which adhesion removes them from the liquid.

A safe and inoffensive sewage disposal can therefore be obtained by dilution, if sewage is discharged into and dispersed by a sufficiently large body of moving water which contains enough oxygen to oxidize its unstable organic matter, and enough fine suspended colloidal mineral matter to attract and hold any pathogenic bacteria until they perish. Dilution is practised in a large number of cities in Europe and America and gives entire satisfaction.

Prior to discharge, it has been found preferable, either to screen the sewage or to retain in some other way, the larger floating particles which would be unsightly and unpleasant when left floating upon the surface of the water.

In many cases where dilution is practised or will be practised, it will also be found preferable to remove from the sewage before discharge the bulk of its suspended matter. This matter is otherwise likely to deposit upon the bed of the river or lake, and, if it accumulates to a sufficient depth, it is further likely to putrefy and injure the condition of the water above.

Since it has become possible and economical to obtain an inoffensive sludge decomposition, the removal of at least the gross suspended matter from the sewage before discharge, and its subsequent separate decomposition, seems advisable, so that we can keep our rivers and lake shores as clean as possible.

The discharge into a stream or lake should in any event be into deep water, into as good a current and as far from shore as practicable.

The oxygen content of the receiving water and the facilities for a sufficient dispersion, control the amount of raw sewage which can be properly discharged into it. Where the quantity and velocity of the water are insufficient, then to prevent offensive conditions, a prior partial purification is necessary. This can vary from a fine screening alone, to a practically complete removal of the suspended matter, such as is accomplished, for instance, by the Imhoff or Emscher tanks, to be described below.

Wherever the surrounding circumstances are such that the comparatively slow disappearance of the pathogenic bacteria in the diluting water is not satisfactory, it is both feasible and economical to disinfect the sewage, after sedimentation and before its discharge, by small doses of hypochlorite of lime, as now successfully done both in Europe and America.

Although the method of sewage disposal by dilution has been attacked as unsanitary, it is still the one most used, and with the above precautions, it is now recognized to have an equally high value, from an hygienic standpoint, as the other methods to be described below. It has also the advantage, if properly carried out, of at once removing the possibility of the sewage becoming offensive, and it is often the least expensive method of final disposal.

Disposal by Treatment on Land

Where the conditions for oxidation by a proper dilution in large bodies of water do not exist, sewage must be oxidized by treatment on land. Again, we shall generally find it best, because more effective in the results, and more economical, to separate either partially or pretty thoroughly the suspended from the liquid matter, varying from simple screening to sludge precipitation. The liquids alone can be oxidized more rapidly and cheaply, than if they are mixed with gross solid matter, and the latter can be inoffensively digested more effectively in a semi-solid state than if diluted in the sewage. When thus segregated the solids may be digested in the same manner as above-mentioned. in the case of dilution. Therefore, under the present heading the treatments refer chiefly to the oxidation of the liquids and fine suspended and colloidal matters.

Oxidation of dissolved organic matter is more rapid on land than in water, because both oxygen and aerobic bacteria are more abundant in the air. To get the greatest efficiency, it is necessary to expose to the air as large and as thin a surface of sewage as possible. This is best accomplished by its percolation through porous bodies. The smaller the size of the grain, the greater is the exposed surface of the material in a cubic foot of material over which the sewage can spread. Therefore, sand has been found to be the most effective material for sewage purification. For economic reasons the size of the grains has been increased even to fist size. Coarse grained materials are also often preferred on economical grounds, as the velocity of percolation through sand is slow and clogging of the pores is more frequent.

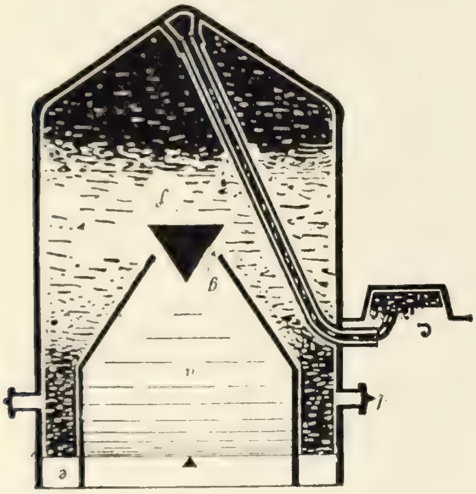


Fig. 1.—Diagrammatic cross-section of Imhoff tank.

While the distribution of sewage over sand beds is readily accomplished by simply flooding the area, the distribution upon a coarse grained bed must be accomplished either by so-called fixed or movable sprinklers (sprinkling or percolating filters), or by alternately filling the pores and then withdrawing the sewage (contact beds), whereby the sewage retained upon the surfaces of the grains becomes exposed to the air and oxidized.

It is not my purpose to enter further into details of these sewage liquid oxidation processes, as the sprinkling filters and contact beds have been so frequently and thoroughly described. It is my purpose here to mention only the essential processes and the general means of accomplishing the same.

The degree of purification is dependent chiefly upon the area of ripe bacterial slime covering the surface of the sand grains or broken stone to which the sewage is exposed, upon the time during which it is so exposed and upon the freedom with which the oxygen of the air reaches every particle of the sewage.

These conditions being fulfilled, there need be no offensiveness of the process, because the presence of oxygen precludes putrefaction. Experience has shown that pathogenic bacteria, as a rule, do not survive the passage through sand filters. In coarse grained filters, where the percolating velocity is greater, pathogenic bacteria do pass through the beds. When their extinction at the beds is demanded, a treatment of the effluent liquid with hypochlorite of lime will disinfect it at a reasonable cost.

Experience both on large and small scales has abundantly proven that with a proper design and construction of the works and with intelligent and faithful operation, sewage liquids can be disposed of not only by dilution, but also on land, when delivered at the works in a fresh state, without any danger of distributing pathogenic germs, nor of emitting any foul odors, when ordinary care and cleanliness is observed.

Sludge Treatment

As mentioned above, both for a disposal of sewage by dilution and on land, we generally get better results after the liquids and solids are more or less separated before any treatment is attempted than when they are mixed, because the methods of treating liquids and solids are essentially different.

Passing over the simple removal of suspended solid matter by screens, we shall now point out the essentials in treating the solid matter known as sludge, which is obtained by natural deposition or by chemical precipitation. These two processes result from a short detention of the sewage, between 1½ and 2½ hours, and differ only by the first process being natural sedimentation and the second one, after the addition of a coagulant, a precipitation of a larger amount of the suspended matter and particularly of the finer particles, than is accomplished by natural sedimentation, and thus gives the effluent a higher degree of clarification.

Formerly, sedimentation and precipitation were secured in simple tanks, on the bottom of which the accumulated sludge was retained and subsequently, depending upon composition and age, was more or less reduced in bulk by putrefaction.

Now, double-decked tanks are used which entirely separate liquids and solids. Until within a few years a satisfactory sludge treatment had defied every solution. At present it is possible to convert the settled solids, inoffensively, efficiently and economically, into a material which is permanently inoffensive and resembles garden soil or humus.

Based on the experiments of Dr. Travis at Hampton, England, who I believe was the first one to efficiently and economically separate, on a large scale, sewage liquids and solids in double-decked tanks, it was left to Dr. Imhoff, of Essen, Germany, to discover and designate the essential details by which sewage sludge, thus separated, can be inoffensively decomposed and within a few months' time reduced to one-sixth and even one-eighth of its original bulk, a reduction which no other process had accomplished in as short a time.

This important discovery has now made it possible to dispose of sewage sludge under all usual conditions without offence, a result which has been desired since sewage treatment was first attempted.

Figure 1 is a diagrammatic cross-section of the Imhoff tank. The two chambers or basins, one over the other, are readily seen. The sewage flows through the upper one and is retained therein, by reducing the velocity, long enough to allow the suspended matter to settle and slip through the indicated slots into the lower chamber. It has been found that a retention of about 2 hours is sufficient to allow all of the suspended matter to settle out for which it is usually economical to provide tank capacity.

There is no flow whatever through the lower chamber. The sludge accumulates in it, the oxygen is quickly exhausted and oxidation no longer takes place. At first there are several kinds of decomposition going on, produced by different kinds of bacteria. After a permanent condition or "ripeness" has been reached, which generally requires several months, there are substantially but two kinds of bacteria left at work, namely, those producing respectively methane gas and carbon dioxide gas in the proportion of 3 to 1. These gases are practically non-odorous and, therefore, there is no putrefaction in the tank. A removal of the undecomposed sludge from any part of a tank after it has ripened, indicates no odor, even though the sludge is not yet rotted out.

Until the tank has ripened, many kinds of bacteria settle with the sludge, and among them also those producing putrefaction. Therefore, during the first few months after installation there is some odor. The lively evolution of gases after the tank has ripened and the correspondingly great development of the bacteria causing the same, apparently prevents the bacteria of putrefaction from increasing sufficiently to produce offensive gases.

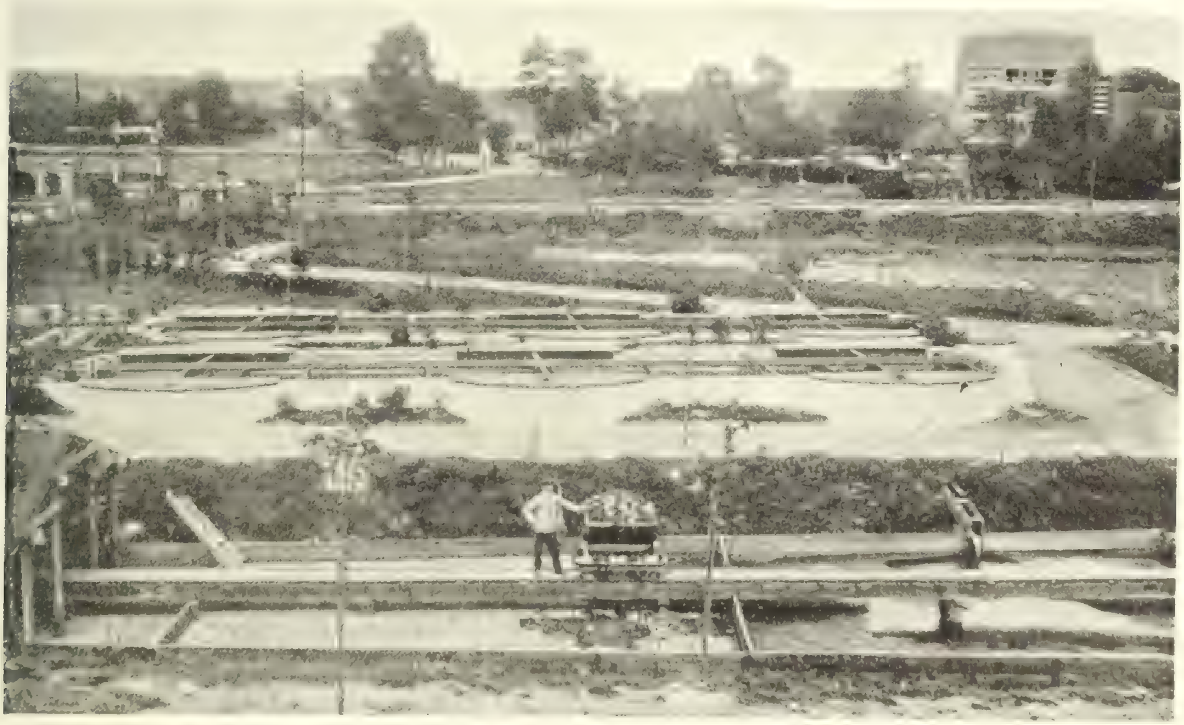


Fig. 2.—Recklinghausen Sewage Disposal Works. Capacity is 9,000 cubic meters daily from 30,000 inhabitants. The plant consists of six small Imhoff or Emscher tanks. To the right may be seen digested sludge flowing out with a water content of about 80 per cent; in the centre and front the sludge drying beds and a truck upon which the sludge is wheeled away.

During the decomposing process the gas bubbles work up through the sludge and superincumbent water to the air where it escapes. In rising it carries with it particles of light or fatty solid matter or scum collecting at the surface in shafts provided for the purpose. This scum may be withdrawn or forced down again with tools to allow some of it to undergo further decomposition. The boiling process keeps the sludge loose, full of gas bubbles and in an active condition, so that the decomposition is rapid and thorough. No such lively ebullition is observed in the old septic tanks.

Corresponding with the speed of the decomposition the sludge at the bottom of these tanks has been thoroughly freed from its non-resistant, or rapidly decomposing, organic matter within two months. In other cases it has taken six months to rot out and become inoffensive.

To maintain the best condition in such tanks the composition of the sewage should not vary greatly, and it is particularly desirable that no trade wastes enter, of a kind which might injure or destroy the beneficial classes of bacteria which have adjusted themselves to decompose the normal sewage. Such trade wastes would be those of a poisonous character. Most of the usual trade wastes do not injuriously affect the bacteria producing both of the above-mentioned inoffensive gases.

Where it is necessary to obtain greater clarification of the effluent water some chemical precipitant, as sulphate of alumina, sulphate of iron or lime have been added in small quantities. The addition of these chemicals apparently does not injure the efficiency of the bacteria, but materially increases the amount of sludge for final disposition, which means that the tanks must be made correspondingly larger and that the operating expenses are also increased. There are many cases where this additional expense will be justified.

Not only does this double tank treatment eliminate the usual offence of sludge treatment, but the health requirements are also satisfied. As it takes several months for the sludge to rot out in the lower chamber, the pathogenic bacteria which may have entered at the top do not survive in this unfavorable medium, as there is no evidence of such bacteria in the sludge that has been withdrawn. There is much less chance for a survival in this tank than in the application of ordinary manure to our agricultural fields.

When the sludge has rotted out, then it can be automatically withdrawn under the water pressure of the upper tank, and discharged outside into a channel, as seen in the sketch. It is better to withdraw it frequently in small quantities than to wait until large masses have accumulated, by which the bacterial activity in the lower chamber may be disadvantageously disturbed. The withdrawn sludge has no offensive odor. At first, and for a short time, it smells faintly of tar, the cause of which is not yet known.

Sludge when taken from the old septic tanks, after several months, is generally odorous, sticky and slimy. The decomposed sludge when drawn from the Imhoff tanks is non-odorous, earthy and friable. It is filled with gas bubbles, which are compressed when the sludge is at the bottom of the tank, but expand when withdrawn on reaching the surface, which expansion makes the sludge porous and easily drained and dried, qualities which septic tank sludge does not possess.

The sludge when it leaves the tank is spread out in a thin layer over drying beds that have been underdrained. Experience has shown that such sludge will dry within a week to a degree that allows it to be spaded and removed. It may be used for top soiling or for filling up low ground.

Figure *2* is a photograph of the works at Recklinghausen, near Essen, I think four years old, the oldest plant of this character, showing a view of the tanks, the outflowing sludge and the drying beds in front. It also shows the neighborhood of buildings and indicates the general appearance of the plant and the surrounding grounds.

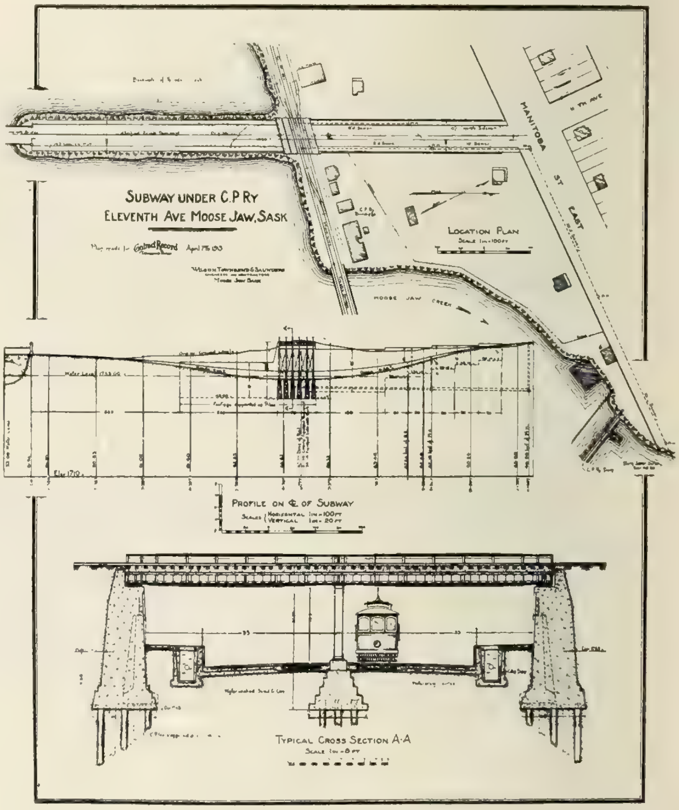
In Germany there are already over 100 such plants in operation or building, and in the United States there may be a dozen under way, and a few are now operating as satisfactorily as in Germany. Wherever the design, construction and operation conform to the experience so far gained, no offence surrounds any plant. With the advance thus made in sludge disposal, we have at last reached the point, when, with intelligent and faithful labor, sewage sludge can be economically produced, decomposed and spread upon land, without creating objectionable conditions at any stage of the process.

IN a recent paper, M. J. Bied, of Viviers, in France, states that in mortars there are two kinds of permeability, one that may be termed normal and the other due to diffusion. A wall penetrated by water under pressure cannot retain its normal permeability, for the material is humidified in part by capillarity. In cases where action of this kind takes place, saline compounds are carried from the interior of the mortar to the exterior of the wall, and any salts contained in the water are diffused in the exterior of the mortar. With the object of obtaining data relative to the substance capable of making mortar impermeable by diffusion, the author prepared small test specimens and immersed them for varying periods in a solution of sodium sulphide. After removal the specimens were broken and, their surfaces having been washed, they were placed in a solution of acetate of lead. It was found that wherever the sulphide had penetrated, the mortar was discolored by the formation of plumbic sulphide. Further investigations showed that a considerable degree of impermeability could be secured by the addition of barium aluminate, which being transformed into barium sulphate closes the mouth of the capillary canals.

The Construction of the Eleventh Avenue Subway at Regina, Sask.

SINCE the design and construction of modern subways or viaducts has become somewhat standardized, in the following article we shall deal chiefly with the features where the sub-way under consideration offers details of interest to the engineer in designing and also to the contractor who may encounter similar working conditions.

Just before entering the depot at Moose Jaw, Sask., from the east, the C. P. R. main line right-of-way crosses Eleventh avenue, a 66 ft. thoroughfare, connecting the north and south sections of the city. By an order of the Dominion Railway Commission, dated November 21st, 1911, a 5-track sub-way was ordered to be constructed at that location. By referring to the accompanying diagram it will be noticed that the Moose Jaw Creek runs very close to the location of the sub-way, in fact Eleventh avenue, south of the C. P. R. right-of-way, is the result of a fill made some three years ago and the grade line of the sub-way runs about 1 ft. 9 in. below high water on the river, while the concrete footings are 10 feet below water level.



In reporting on the feasibility of constructing this sub-way, naturally the question of drainage when completed was of vital importance. In order to overcome the necessity of handling the accumulated surface water by pumping, a storm sewer, 1200 feet in length, was designed. Using a 125 per cent. grade, it was found that discharge could be made at the point indicated below the C. P. R. dam on the river. This sewer has since been constructed, but it is a point worthy of note that it cannot be used as a drain for the accumulated water in the excavation during construction, as with such a small pipe and flat grade, sand-laden water cannot be transported without causing serious danger of blocking up the pipe.

The rain and surface water having been provided for, it was necessary to consider a method for keeping the river water from percolating up through the concrete base and damaging the vitrified brick pavement which forms the road surface. In the accompanying cross-section of the roadway and curb, it will be seen that a waterproofing material is laminated in the concrete base. This consists of five layers of Neponsit Waterdyke Felt, cemented together with Neponsit Compound in the following manner.

The felt, which is 36 inches wide, is laid shingle fashion, applying first a course of two layers in which laps of the sheets are not less than 18 inches, on top of which is applied a second course of three layers in which the laps of the sheets are not less than 24 inches, making a total of five layers. Where the sheets overlap one another they are stuck solidly and there is a layer of compound between each layer of felt, i.e., in no part of the diaphragm does felt touch felt. The whole surface is given a final heavy coating of compound before concrete is applied. The outside of all walls and abutments exposed to earth was waterproofed with a ¼ inch layer of asphalt waterproofing before backfilling.

View of north side of tracks during excavation.

The two main piers and the retaining walls south of the railway tracks are supported on piles as shown. In addition to the eighteen feet of penetration called for, these piles were driven four feet below the ground level with a follower, and it might be interesting to know that this was accomplished with a No. 3 Midland Steam Hammer, operated from a 15 h.p. boiler. The material through which the piles were driven consisted of alternate layers of blue clay and sand. An average day's work with the equipment was 15 piles.

In excavating the trenches for walls and footings below water level, 3-in. T. & G. sheeting was used which made an impervious barrier to water from the sides. This trench was then bulkheaded off in sections of about 100 feet and the water pumped out by means of a No. 7 pulsometer pump. After the concrete footings were put in place and allowed to set, it was found that the struts that held the sheeting could be removed, the concrete footing of approximately 15 inches thick and the tongue and grooving of the sheeting being sufficient to hold up the banks on either side, varying from eight to nine feet in height. The carpenters were thus permitted to build and erect their forms for the walls without having any cross struts to add to the difficulty and expense.

During the construction of this work it has been necessary to keep the C. P. R. main line in operation, no less than forty-five regular trains a day being operated over the right of way. In addition to considerable yard shunting. To handle this traffic, four temporary bridges were constructed, the tracks being supported on bents of 25-foot piles (5 piles per bent) placed at 15-foot centres. The piles used for this work were about 15 inches in diameter.

The concrete retaining walls being poured when the temperature was about 80 deg. F., the contraction that would take place when the thermometer fell to 40 deg. F. had to be taken care of. To do this, a U-shaped bulkhead was removed and a thick layer of tar paper tacked on the cross-section of the concrete. The pouring of the next fifty feet was then proceeded with. At these joints, the horizontal temperature bars were terminated and thus the sections of the wall were allowed to contract, being keyed into each other by the U-shaped form of the concrete at each fifty feet interval.

The laying of the street railway tracks, the paving of the roadway and the placing of the steel superstructure remain to be done this spring and the entire work should be completed by June. The contract is being carried out by Messrs. Wilson, Townsend & Saunders, engineers and contractors, of Moose Jaw, under the supervision of Mr. J. Antonisen, City Engineer of Moose Jaw.

Temporary Bridge at Kingston, Ont.

As a result of the decision of the government to build a breakwater for the protection and enlargement of Kingston Harbor, it was found necessary to build a temporary bridge to accommodate the traffic between Point Frederick, Pittsburg and the Royal Military College, as the present Cataraqui bridge had to be removed to make way for the breakwater. The engineers of the Department of Public Works, Messrs. Chapleau and Dense, executed the plans, and Mr. Wm. Leslie, of Kingston, was appointed to superintend the construction of the bridge, which was to be of trestle and pile construction, it being found that the rock on the east shore approached the surface so closely as to prevent piles being driven, thereby necessitating the use of 18 trestle bents placed at 15 feet centres, covering a length of 255 feet lineal.

The rest of the bridge, some 1,125 lineal feet in length, is supported on 75 pile bents, the latter being driven to various depths, varying from 18 to 46 feet below water level, the bottom being very irregular. The ice at this place during the past winter was never very good, not exceeding 10 in. or 12 in. in thickness, and very treacherous, so that it could not be relied upon to carry the pile driving plant. A new plan was therefore adopted by the superintendent, viz., that of placing the derrick and swinging pile driver with the drop hammer and follower of 3,600 lbs. weight, on a car constructed for the purpose. Starting at the east shore the 18 trestle bents were handled by the derrick, put in place, ballasted with stone in bottom of pocket, and the caps, stringers and plank put in place, rails laid and the car hauled ahead. The work thus proceeded, the piles being driven and the work completed in advance of the car and outfit. This plan was found to work very satisfactorily and has made it possible to complete the temporary bridge without placing any weight of the plant on the ice.

The building inspector of Moose Jaw states that he has already in sight for 1913, buildings which will cost $7,000,000. This does not include several promised factories, which will be erected in midsummer.

Early Canadian Bridge-Building

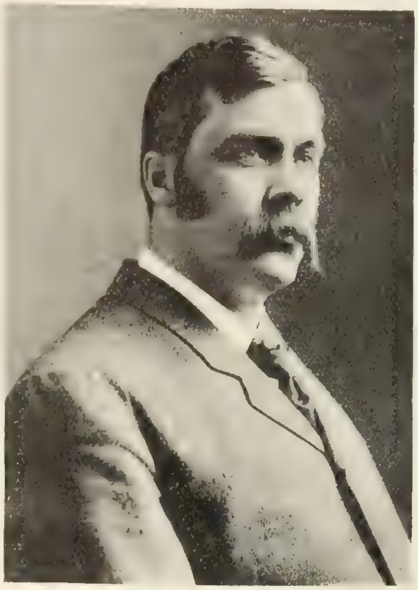
Structures of the Timber, Pontoon and Suspension Types the First in Service—Largest Tubular Bridge over the St. Lawrence

By H. G. Tyrrell, Evanston, Ill.

THE rapid development of transportation facilities in Canada gives special interest to bridge engineering, for it was in connection with the building of the Grand Trunk Railway, the Intercolonial and other lines through Ontario and Quebec, that some of the pioneer work appeared.

While the record of early bridge building in Canada is quite extensive, and might, perhaps, fill a volume, a few stray notes which have come to my attention will be interesting to Canadian readers.

As would naturally be expected, timber, pontoon and suspension bridges were among the first in service. An interesting old pontoon or floating bridge, which has seldom been duplicated or imitated, was built many years ago by George Stewart, of Port Hope. It was three-quarters of a mile long, connecting Sturgeon and Scugog lakes, and was built like a corduroy road. Rafts, 30 feet square, of flattened timber, were connected by six or seven longitudinal beams on which the platform was laid. Another recent bridge in Ontario with a pontoon section, was built about 1900 over Chemong Lake, near Peterborough, the total length of bridge being 3,638 feet. The fixed approach is 913 feet long and the pontoon, 2,620 feet, the latter having an opening span of 105 feet. At five places in its length, the road is 24 feet wide to permit teams to pass, but the rest of the desk is only 18 feet wide. Its cost was $26,000.



Mr. H. G. Tyrrell

There are few bridges and river crossings that have held greater public interest than those over the Niagara river, and it may not be generally known that it was through the efforts of a Canadian that the first charter was obtained for crossing the gorge. It was in 1844 that it was first promoted by Mr. William Merritt, of St. Catherines, Ont., though the charter was not actually granted until two years later. Four prominent bridge engineers, Charles Ellet, John Roebling, Samuel Keefer and Edward Serrell, were invited to report on the feasibility and cost of the work, and their reports were all favourable. It is interesting to note that each of these men in later years actually built a bridge across the Niagara gorge.

A bridge at Lewiston, two miles below the falls, was started in 1850 under the direction of Captain Edward W. Serrell, who built many other fine suspension bridges throughout Canada and the United States. The distance between cable supports was 1,040 feet, but the road was only 850 feet long and 21 feet wide and the cable sag 87 feet. In 1861, when the guy cables had been temporarily removed, the bridge was wrecked by a wind-storm, and it was not repaired or rebuilt until 1899, when a new one (Fig. 1) to carry a highway and one line of electric cars in the middle, was erected under the direction of Mr. L. L. Buck. Other interesting suspension bridges of the time, in Canada, are those at St. John, N.B., now being replaced, and one at Montmorency Falls, Que. The St. John Bridge was designed by Mr. Serrell in 1852, and carried a platform 100 feet above the river, the span being 640 feet. It had ten cables and stone towers, and was rebuilt in 1857. The Montmorency Bridge was located just below the falls adjoining the residence of the Duke of Kent, but it collapsed some years ago, carrying a wagon and its driver into the cataract 250 feet below. When examined by the writer a few years ago, only the stone towers were then remaining. The old Chaudiere highway suspension over the Ottawa River at Ottawa, was removed in 1888. The associates of Mr. Serrell afterwards introduced his methods in the United States, and one of his co-workers, Mr. Thomas M. Griffith, in 1885, built the first suspension bridge over the Mississippi, at Minneapolis, the span being 620 feet.

The Niagara-Clifton suspension bridge, located a short distance below the falls, was begun in 1867, under the direction of Mr. Samuel Keefer, of Ottawa, and was completed by him twelve months later. It had a span of 1,260 feet between centres of wooden towers, and iron wire cables with a sag of 90 feet, 12 feet apart at the middle of the bridge, and 42 feet apart at the towers, the cables being imported from England. The floor was 190 feet above water and was carried by vertical suspenders 5 feet apart. The stiffening trusses were 6½ feet deep and the bridge

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*Mr. H. G. Tyrrell was born at Weston, Ont., in 1867. He graduated from the School of Practical Science in 1886, receiving a post-graduate degree of C. E. in 1894. After graduating, he spent a year on exploration surveys in Western Canada and three years as instrument man on railroad construction in Quebec and Maine. For many years then he was engaged on the design and construction of bridges and buildings as designer, estimator and engineer. For a time he was Chief Engineer for the architectural firm of F. M. Andrews & Company, of Cincinnati and New York. Since 1908 he has been engaged as a consulting engineer and author. He practices professionally at Evanston and Chicago. As a contributor to technical journals he is well known in both America and Europe. He is the author of the following books: History of Bridge Engineering; Artistic Bridge Design; Concrete Bridges and Culverts; Mill Buildings; Engineering of Shops and Factories.

was further braced with twelve wire stays from each tower to the floor. There were also side guys anchoring the bridge to the shore and preventing excessive vibration from the wind. The original cost was $22,000. The road has a clear width of only 10 feet, not great enough to permit carriages to pass, and in 1888 it was widened to 17 feet, alterations being completed in December of that year. On January 5, 1889, it was blown down, but it was replaced in four months by a new structure with steel wire cables, steel towers and stiffening trusses, and was re-opened to travel on May 7, 1898, a remarkably rapid piece of reconstruction. The whole bridge was replaced ten years later by the present 840-foot steel arch.

A design for a timber bridge, made about fifty years ago by Mr. William Tyrrell, of Weston, Ont., the writer's father, was intended to carry King street over the River Don in Toronto. A walnut model (Fig. 2), about 10 feet long, was very carefully made, and fastened together with brass bolts and nuts, and it is still in the office of Mr. James W. Tyrrell, civil engineer, at Hamilton. It has three lines of combined truss and arch, and though some parts are missing, the model, as a whole, is well preserved.

It is a distinction also that Canada had the largest of all tubular bridges, that which crossed the St. Lawrence River, at Montreal. This notable structure was designed by Robert Stephenson, and built during the years 1854 to 1860 under his direction, with the assistance of James Hodges and A. M. Ross. It was similar to the Britannia bridge over the Menai Straits, the iron tubes being 6,592 feet long, and the total length of bridge 9,144. The piers are 18 feet thick at the water line and the piers and abutments contained more than 100,000 cubic yards of masonry. The bridge carried a single line of railway only, and had a cross-sectional area of 16 by 20 feet. The tubes contained 9,044 tons of iron, the clear headroom underneath for the passage of ships being 60 feet, and they were built on scaffolding in their final position, all the shop work of fabrication and punching having been done in England. The floor and roof were of stiffened plates. Ventilation holes were left in the sides, but as these were insufficient to carry off the gas and smoke from the locomotives, a strip of iron was removed from the roof, and the edge of the opening was reinforced with new plates and angles. A permanent travelling carriage on the roof was used for inspection and painting, the area for painting in each coat being 32 acres. The water current in the river is seven miles an hour, the greatest depth being 22 feet. Messrs. Peto, Brassey & Betts were the contractors, and the cost is reported at $5,000,000. Both the Britannia and the old Victoria Bridges resulted in serious financial loss to their builders. The latter was replaced in 1897 by a new truss bridge with open webs, which weighs twice as much and has five times the capacity of the old one, but which cost only $1,500,000. A tubular bridge over the Ottawa River at its junction with the St. Lawrence was removed in 1899. This was the last of its kind in America.

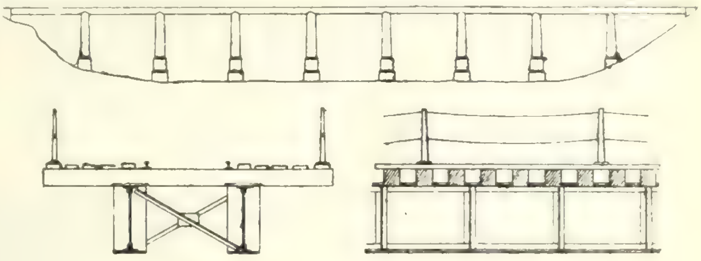

Fig. 3

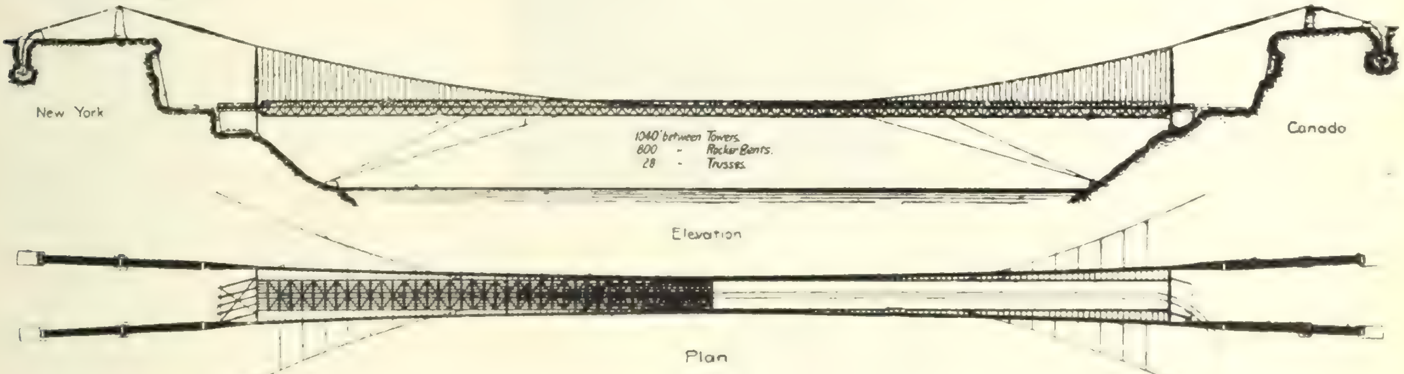

Fig. 1

Fig 2.—Model, made about 1860, by William Tyrrell, of Weston, Ont., for a bridge to cross the Don River, Toronto.

When building the Grand Trunk Railway, very general use was made of plate girders on high masonry piers like that (Fig. 3) over the Humber at Weston, Ontario. This bridge is 650 feet long and 70 feet high, with nine spans of 72 feet. Two lines of girders 4 feet 4 inches deep, supported 8 by 12-inch ties 18 feet long, and the deck was guarded on each side by two lines of light chain in iron railing posts. The lower 12 feet of the piers are stone, but above that they are faced with brick. The piers are 7 feet thick and 15 feet wide at the top and are capped with stone on which rest cast iron bed plates under the girders.

A new era in Canadian bridge engineering began thirty years ago with the building of the Canadian Pacific Railway. Since that time the number of fine bridges has so rapidly increased as to make any general description impossible. Accounts of many imposing structures on the Canadian Northern and Grand Trunk Pacific are already familiar to most readers of the Contract Record, and they reflect great credit on their engineers and builders.

Canada's railway mileage, June 30, 1912, 26,727; or (including all tracks and sidings) 34,629, doubled in twenty years. Mileage in 1836, 16; at Confederation, 1867, 2,278. Increase, over 1,000 per cent.

Sewerage and Drainage Improvements at Edmonton

By Alexander Potter, Consulting Engineer, New York.

IN the spring of 1910 the author was retained by the city of Edmonton to make an investigation and prepare general plans for an extensive system of sewerage, drainage and water supply designed to meet the requirements of the city of Edmonton for some time to come.

In 1880, the city of Edmonton was nothing but a small trading post; in 1900 it had a population of some 2,500, and in 1910 the population was roughly estimated at 26,000. To keep pace with this growth the city had constructed from time to time a number of sanitary sewers and storm drains, not, however, along the lines of any well-defined plan. When in 1910 the growth of the city made necessary extensive improvements to the sewerage system, the Engineering Department was confronted with a problem which appeared to be difficult of solution.

Mr. Alexander Potter*

Topography.—The main part of the city is located on a flat plateau 168 feet above the Saskatchewan River. The central portion of the plateau is from 0 to 30 feet lower than its edges along the river.

The natural drainage of the central portion of the plateau is poor. A small swampy stream about one and one-half miles back from the river drains the central basin of the plateau more or less imperfectly. This stream, which is known as Rat Creek, flows in an easterly direction and empties into the Saskatchewan River at the eastern end of the city. For the last mile and a half of its course, Rat Creek flows through a deep gorge.

Combined Sewers Recommended.—A very great portion of the interior of the plateau cannot be developed without first constructing an effective system of surface drainage. It was found impracticable to carry off the surface drainage by a system of shallow drains. The flatness and the great extent of the interior plateau basin made the cost of such a system of shallow drains prohibitive. To overcome this difficulty, the writer recommended the construction of a system of sewers to be constructed in tunnel so as to utilize to the fullest extent the elevation of the plateau above the river.

Again, in a city with the remarkable growth of Edmonton, it is impossible to predict with accuracy the trend of maximum growth. With main sewers at great depth, it is a simple matter to extend the system in the future in any direction that the city may happen to grow.

Figure 1 is a sketch of the tunnel system recommended and which is now under construction. The main tunnel system consists of 13 miles of circular sewers, ranging in size from 4 feet to 10 feet 6 inches.

Although it cost considerably more to construct a sewer of a given size in tunnel than it does in shallow cut, it is far cheaper to construct sewers in tunnel in the case of Edmonton, as by doing so, advantage is taken of the steep grades, thus reducing the size of the sewer required materially.

It was not considered advisable, for economical reasons, to extend the tunnel system to the western end of the city. The storm drainage from this section will be taken care of by an independent storm drain constructed in tunnel, varying in size from 4 feet to 6 feet. The house drainage from this district is to be collected by a separate system of sewers with outlets into the main tunnel system.

When completed, there will be three distinct tunnel systems: one in the western end of the city, which will carry off storm water only; the main tunnel system, which carries combined drainage, and a tunnel system in the extreme eastern part of the city, for combined drainage.

The shafts used in the construction of the sewerage system are to be used as inlets for drainage. Fig. 2 illustrates the construction of one of these drop manholes.

Tunnel Sections

Provision was made in designing the tunnel sewers to have the shell thick enough to withstand whatever pressure may be brought upon it. Although the

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*Mr. **Alexander Potter,** of New York City, who has attained to eminence in the consulting field on the other side of the border, spent the greater part of his boyhood in Halifax, N.S., and began his engineering career in the office of the city engineer, the late Mr. E. H. Keating. Later he was employed by the C. P. R. on survey work in the State of Maine. He graduated from Lehigh University in 1890 and accepted the appointment of assistant city engineer for Halifax, N.S., again under the late Mr. Keating. Subsequently he returned to the United States, but he has retained a keen interest in Canadian affairs and his parents and family reside in this country. Mr. Potter has been associated as designing, constructing or consulting engineer with many important works in the United States, while he has been particularly active as an expert arbitrator. He designed the waterworks and sewerage systems for the cities of Renfrew, Ont., Fernie, B.C., and Strathcona, Alta. In addition to his work in connection with the **Edmonton** sewerage improvements he reported upon a new water supply, his recommendations having recently been confirmed by a board of three Canadian engineers, Messrs. Francis, Lee and Ross. Mr. Potter is a member of the Canadian Society of New York and of the Canadian Society of Civil Engineers.

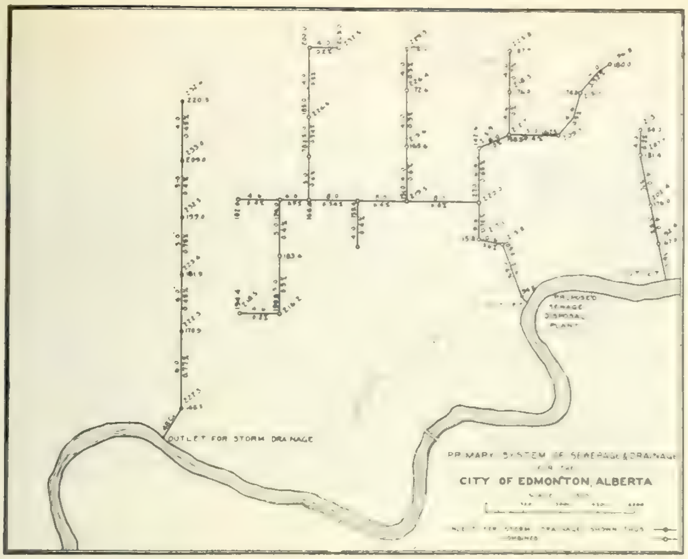

OUTLET FOR STORM DRAINAGE
PROPOSED SEWAGE DISPOSAL PLANT
PRIMARY SYSTEM OF SEWERAGE & DRAINAGE FOR THE
CITY OF EDMONTON, ALBERTA

Fig. 1.

Details of Sewerage and Drainage Improvements at Edmonton, Alta.

carrying capacity of the sewers is ample for some time to come, conditions may at any time develop in which more water will enter at the inlets than can be carried away by the sewer. Under such conditions the tunnel sewer would flow under pressure and be subjected to hydrostatic heads varying with the depth of the sewer below the surface and its distance from the outlet. No design can be considered safe in which the shell cannot withstand, without injury, such internal pressure. Only with reinforced concrete or concrete block construction can a shell be constructed with sufficient strength to resist the internal pressure, and be counted upon to be sufficiently watertight so as not to endanger the stability of the foundation.

Dependence cannot be placed on obtaining a satisfactory structure in tunnel with reinforced concrete, especially when heavy timbering is necessary. Under such conditions reinforced concrete construction is very costly. Where so much dependence is to be placed upon the uniform high character of the work, it is impossible to throw around the work too many safeguards. On the other hand, with reinforced concrete blocks, the results obtained can be counted upon at all times. Sufficient tensile strength can be given to the block construction to resist the internal pressure.

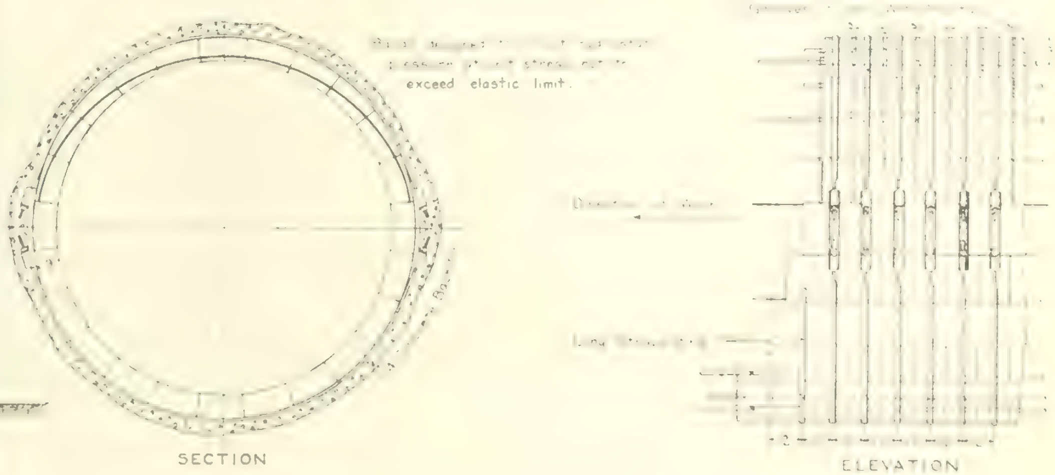


Fig 3.—Typical sewer construction in tunn

Figure 3 illustrates the construction of the sewers in tunnel. The upper half of the sewer is reinforced with circumferential bars to resist the external pressure. To bind the blocks together longitudinally, straps are used, 1½ inches wide and 1/8 inch thick, placed in the joints of the sewer. The internal horizontal pressure is taken care of by encircling the block construction every twelve inches with steel bands. These bands are designed to take care of the internal hydrostatic pressure at a unit stress not to exceed the elastic limit of the steel. The bands are made in two sections. After the concrete invert has been constructed, the lower half of the band is placed upon it and the blocks are set in mortar. After the completion of the full ring, the upper half of the band is slipped over the block construction and the two sections connected together by coupling shoes. A lean concrete backing, about 4 inches thick, protects the band from corrision. The blocks are designed not to weigh more than 150 lbs. They range in thickness from 5 inches for the 4-foot section to 9 inches for the 10-foot 6-inch section. All of the blocks are 12 inches long. Six blocks are used for constructing the four

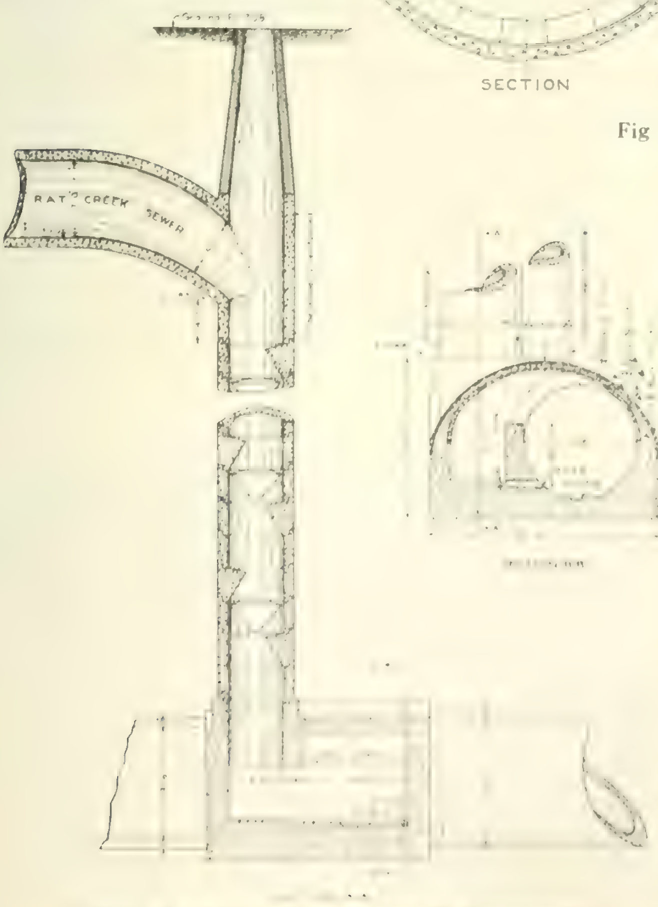


Figure 2.—Typical drop manhole construction

[illegible] size and twenty four blocks for the larger size.

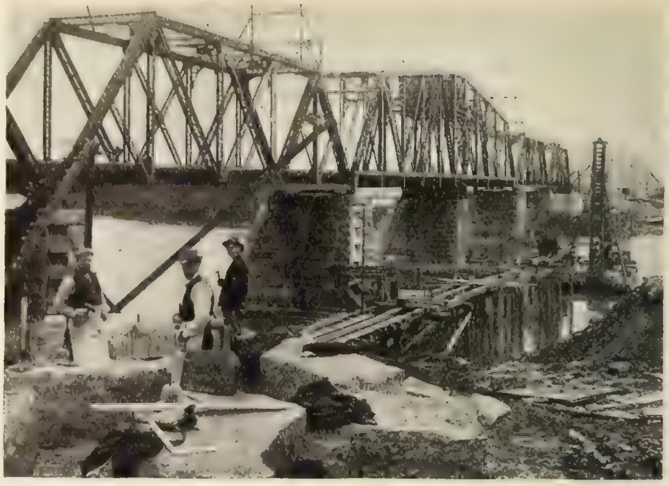
The 10 foot 6 inch outfall sewer is now under construction, and is estimated to cost $179,000.

Contracts have recently been let for the larger portion of the tunnel system, amounting to $1,777,000. The following are the unit prices for the various sizes of sewer:

Size	Cost per lineal foot.
10 ft. 6 in.	$53.89
8 ft.	53.35
6 ft. 6 in.	43.00
6 ft.	36.90
5 ft.	29.90
4 ft. 6 in.	25.50
4 ft.	24.00

The work is being constructed under the direction of Mr. A. J. Latornell, City Engineer.

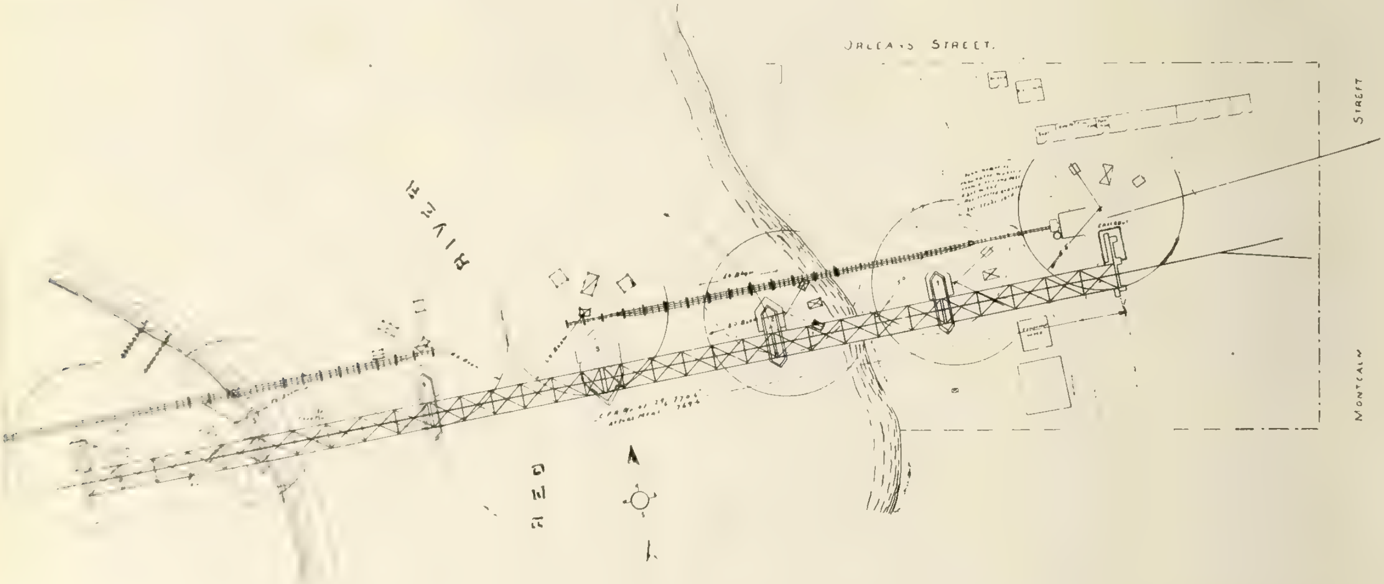
Substructure of the New C. P. R. Red River Bridge at Winnipeg, Man.



General view down-stream end of bridge, showing cutters getting out stone for Pier No. 1. Building temporary trestle.

THE double-tracking of the Canadian Pacific Railroad from Fort William to Winnipeg, and west, necessitated the widening of the old bridge across the Red River at Winnipeg. The old structure was 669 ft. long, consisting of four Pratt trusses and one 256 ft. rim bearing swing span, operated by gasoline motors. This has been replaced by a new double track bridge, with a swing span of the center bearing type.

The contract for widening the substructure was awarded to the Foundation Company, Limited, of Montreal, in February, 1912, and was to be completed by August 15, 1912. The work was ready for steel on August 1, 1912, nearly two weeks ahead of contract time. The superstructure is being erected by the Dominion Bridge Company of Montreal.



General plan of C. P. R. bridge over the Red River at Winnipeg.

The old piers were carried down to hardpan, and were built of Tyndall limestone facing, with concrete hearting. The masonry of the new portions was built of the same material, and was bonded in such a manner as to show no demarcation between old and new work. The piers were excavated to hardpan by means of pneumatic caissons and open cofferdams.

The work was divided into two parts, one being done while the river was frozen and the other after the ice had broken and the river was clear. The first included all of the piers, which were to be sunk by the open cofferdam process, except the east and west abutments, as they were excavated while the ice was breaking up.

The second part of the work consisted in sinking the caissons and completing the masonry of the other piers above water. The depth of water at the bridge site was 25 feet in winter and 32 feet in summer. This variation was due to the St. Andrews curtain dam at the mouth of the river, which controls the water level, in order to make the river navigable to Lake Winnipeg. Spring flood was about 10 feet above ice level. The ice was 3 feet thick.

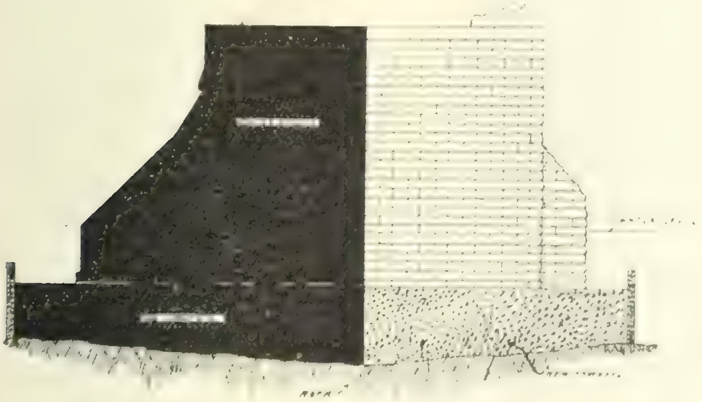
Construction of the Piers

The abutments are on the shores, the intervening piers being in water varying from one foot to thirty-two feet in depth. The new portions of the piers were designed similar to the old work in order to make the finished structure uniform in appearance. Pier No. 3 was the only exception.

Pier 1—The cofferdam for pier No. 1 consisted of two drives of 3 in. T. & G. sheeting, driven down as the pier was excavated. 10 in. x 10 in. rangers were used. This pier was excavated when the river was frozen and had practically no water in the cofferdams. The specifications required the excavation to be carried to bed rock, if possible, but in view of the thickness of hardpan and its excellent quality, it was decided to stop at good hardpan. A 1:3:5 mixture of concrete was used throughout the entire work.

Pier 2—The cofferdam and construction of this pier is of the same general character as that of Pier No. 1. The excavation was carried beneath the old pier, as good hardpan could not be found at the foot of the old crib. In order to prevent any settlement of the old pier, 12 in. 31½ lb. steel I-beams were driven as steel sheeting in front of and below the old nose. This prevented any loss of material from under old piers. The crib timbers were removed to elevation 711, and the pier was concreted to low water level. Above this point masonry was used.

Pier 5—In the cofferdam of this pier, 35 lb. 12 in. U. S. steel sheet piling, 40 ft. long, was used. The subsoil consisted of a very soft watery clay, which necessitated the above. The excavation was carried to elevation 706, and 25 ft. piles were driven to hardpan. Concrete was brought to low water level and masonry was set from this point to the coping. The steel sheeting was removed when pier was completed.



Completed pier.

The abutments were constructed while the ice was breaking in the river. The cofferdam consisted of 3 in. sheeting braced by 10 x 10 waling pieces. Piles were driven in each abutment. Concrete was used wherever it did not conflict with the uniformity of the finished pier. Pier abutments were used.

Pier 3—The pneumatic process was used at this pier, as 32 feet of water existed at this point and there was uncertainty as to the depth of footing of the old portions of the pier. This precluded any danger to the old structure. The caisson was designed to fit the crib of the old pier. The working chamber was built on shore and launched when built up 12 feet. After launching, the caisson was pulled into position and concreted as it was being built up.

Building up caisson at Pier No. 3.

Pumping joint at Pier No. 3.

To join the old pier to the new addition, the space between the crib and the masonry was cleared of riprap and a concrete bulkhead placed at each side. Sheeting was then placed against the bulkhead and timber of the caisson. Concrete was placed under water with tremies and the joint was pumped dry after twenty-four hours.

The addition is concrete—bonded by ¾ in. rods placed in every course of masonry, about 3 feet center to center. At the sides where the concrete and masonry joined, every alternate stone was removed and the rock face of the intermediate stones dressed.

Pier 4—At this pier the pneumatic process was also used and the joint was made in a manner similar to that at pier 3. The shape of the nose of the old being triangular, the caisson was made to fit same.

Plant—The heavy plant used was as follows:—1-100 h.p. Oil City boiler; 2-80 h.p. Kewanee boilers; 1-6 in. Cameron pump; 2-8 in. centrifugal pumps; 1 [illegible] yd. Ransome mixer; 1-½ yd. Smith mixer; 1-2,000 lb. drop hammer; 6 stiff-leg derricks; 6 D. D. hoisting engines and boilers; 1 single drum engine; 1 Vulcan steam pile hammer; 2 Ingersoll Rand air compresseors.

The work was excuted by The Foundation Company, Limited, whose head office is at Montreal, P.Q.

Messrs. F. Lee and J. C. Holden were the engineers in charge for the Canadian Pacific Railroad.

APPLICATION has been made for a patent for a collapsible stone measuring form for use on highways. It is customary in roadbuilding to dump the stone in unsightly piles at the side of the road. In building the state roads in New York this made it difficult for the state inspector to measure the stone. It was at his suggestion that the new device was adopted. It consists of a box with hinged corners which allows it to be folded up and placed on the top of the wagon load of stone. The driver, when ready to dump his load, simply takes off the box, sets it up and dumps his load in. As the sides of the box are bevelled, when the form is removed it leaves the stone evenly piled. It holds just a half yard of stone, and the inspectors are not obliged to stop and estimate the quantity in each pile [illegible], but simply pass along the road and count the number of piles.

The Highways of Europe

Administration, Construction and Maintenance

By Arthur H. Blanchard, Professor of Highway Engineering in Columbia University, and Consulting Engineer, New York City.

CONSIDERATION of the salient and unique features of European practice, and those characteristics of foreign methods of administration, construction and maintenance which should receive careful study by American engineers and officials responsible for the development of systems of improved roads, constitutes the subject matter of this article. In order to confine the paper within reasonable limits, only types of roads and pavements used during the past decade on highways outside of built-up districts will be discussed. Although rectangular stone block, wood block and sheet asphalt have been advocated by some American and European engineers for use on the class of highways referred to above, for the sake of brevity they will not be discussed, notwithstanding their use in Europe, differing materially from practice in America, is deserving of thoughtful consideration.

Professor Arthur H. Blanchard*

Unfortunately, the nomenclature used in connection with the many problems of modern highway engineering is in a state of confusion and results in erroneous conclusions being drawn from reports and papers, due primarily to the natural misinterpretation of technical terms. The writer will, therefore, make a preliminary statement relative to the types of road surfaces in connection with which bituminous materials are used.

Bituminous surfaces consist of superficial coats of bituminous materials with or without the addition of stone or slag chips, gravel, sand, or materials of similar character.

Bituminous macadam pavements are those consisting of broken stone and bituminous material incorporated together by penetration methods.

Bituminous concrete pavements are those composed of stone, gravel, sand, shell or slag, or combinations thereof, and bituminous materials incorporated together by mixing methods.

Sheet asphalt pavements are those having a wearing surface composed of a sand of predetermined grading, fine material and asphalt cement incorporated together by mixing methods.

The campaign in Europe against dust and the deterioration of road surfaces, caused primarily by motor car traffic, was inaugurated by Dr. Guglielminetti, of Monte Carlo, who, during the past ten years, has organized "Leagues Against Dust" in many European countries and the unswerving enthusiasm has worked continually to interest officials and engineers in the necessity for the suppression of dust. The results of his successful experiments with superficial tarring, in 1902 at Monaco, were published throughout all Europe. In the following year trials were carried out at Champigny by the engineers of the Department of Roads and Bridges of France. In the 1903 report on these trials, the French engineers formulated all the basic principles of superficial tarring. Unfortunately the writer has found many instances in Europe and in America, where these simple axiomatic rules have been ignored, resulting in unsatisfactory surfaces and the uneconomical expenditure of many thousands of dollars annually.

After the world powers of Europe had been for several years developing various systems for allaying of dust and the preservation of the road surface, the French engineers, realizing that an exchange of ideas and a dissemination of knowledge acquired were desirable from the standpoint of economical procedure in the future, through the medium of the French Government, organized the First International Road Congress, which resulted in the formation of the Permanent International Association of Road Congresses. The influence of the Association upon all European countries has been far-reaching and decidedly beneficial. In many cases the conclusions and recommendations of one congress are made the basis of new

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construction work, carried out before the succeeding congress. The Permanent Association should receive the hearty support of all interested in modern highway construction, as only through the medium of an international organization will it be possible to economically assimilate and disseminate knowledge relative to methods employed and results secured throughout the civilized world, and to satisfactorily secure an interchange of views and opinions among those interested in the economical construction and maintenance of roads adapted to all the various classes of traffic to which the modern highway is subjected.

While superficial tarring was the only method used extensively during the opening years of the twentieth century, many new methods and types of construction have since been adopted, especially in England. The different types of road surfaces employed in practice by the engineers of the various countries of Europe will be generally referred to before an attempt is made to point out commendable features of foreign practice.

In considering the various methods employed for laying dust and the preservation of the road surface, the use of water and the numerous palliatives with which the European market is flooded will not be alluded to in detail. One interesting and instructive characteristic of foreign practice will, however, be mentioned. The use of the various palliatives by European engineers is based on the economics of dust prevention considered in conjunction with other controlling factors. Two illustrations will be cited.

At the birthplace of the campaign against dust by the use of superficial tarring, namely, in the Principality of Monaco, ordinary watering is used to lay the dust on the boulevards surrounding the beautiful gardens in front of the Monte Carlo Casino. The watering of these surfaces once per hour, in the most scientific manner the writer has ever observed, serves to lay the dust, cool the atmosphere, and furnish a road surface, which is in harmony with its magnificent environments.

The other instance to be cited is the case of the Bois de Boulogne, which is adjacent to the city of Paris. Its engineer, although allowing one of the avenues to the race-course, Longchamps, to be tar-coated for experimental purposes, is a firm believer in the use of palliatives for the boulevards of the Bois, inasmuch as the surfaces thus treated are satisfactory from the standpoint of esthetics, and at the same time dustless. The problem of the maintenance of the many miles of these charming avenues is an extremely complicated one, which has not as yet been solved. The avenues in many cases are subjected to traffic which will rapidly disintegrate ordinary macadam treated with any of the palliatives at present on the European market.

"History of the Road" Exhibit, 1910 Brussels Exposition. Second International Road Congress.

Before dismissing the subject of palliatives, the recent decisions of the judges appointed by the Roads Improvement Association of England to investigate the dust-laying qualities of calcium chloride should be mentioned. The pith of the judges' comments contained in the reports of September, 1909, and March, 1910, is to the effect "that the results of the tests of calcium chloride applied in granular form by the dry method, have shown that it is a very effective dust layer, but the treatment has the ill effects of causing, during the winter months, an abnormal quantity of sticky mud, a decided tendency to licking up and a disintegrating action upon the macadam surface. Notwithstanding this, we are of the opinion that the process is probably not more injurious to macadamized roads than the excessive watering now demanded by the public to effectively lay the dust."

The predominating method employed by the French engineers during the past nine years has been the use of tar as a surface coating, mainly on roads of ordinary macadam. Superficial tarring has been accomplished by two general methods, application by hand and by machinery, both cold and hot tar being applied by both methods. Application by machines has been adopted for many years by some of the French engineers. Two types have been employed, the pressure spraying machine and the gravity machine. There are two forms of the second type, namely, those equipped with mechanical brushes and those without, the further distribution of the tar being accomplished by hand brushing in the case of the latter type. By no means is there a concensus of opinion among French engineers relative to the comparative merits of the various machines.

Another subject under discussion in France, which is of special interest to the motoring public, is with reference to the relative value of allowing the tar coat to remain without being covered with sand, gravel or stone screenings for a period of time or to apply such coating immediately after the application of the tar. As the amount of time considered requisite by various engineers varies from a few hours to one or even two days under similar conditions, it would seem desirable that complete service tests should be made to determine if the advantages claimed for the delayed application of the covering are real or imaginary.

A unique method of surface application, which is only in an experimental state in France, is called by the inventor "goudronnage par le feu." The method consists in the application of cold crude tar to the road

"Tarmac" pavement, Brighton, England 1908

Main county road, Warwickshire, Eng.

surface and the subsequent setting on fire of the tar coat. Comment on the inconvenience caused by burning hundreds of gallons of tar on the public highway is superfluous.

Under the direction of the Technical Commission of the Department of Roads and Bridges of France, many experimental sections of various types of surfaces and pavements are being constructed on the national roads. The most interesting and, in the opinion of the writer, the most satisfactory experiment thus far made, was the construction of a section of an asphaltic concrete pavement on the trunk line between Versailles and Paris in August, 1909. The method consisted of mixing broken stone, sand and asphalt mastic in a caldron. The mixture was spread to a depth of 1¾ to 2 inches on a foundation of ordinary macadam, and thoroughly compacted. The writer inspected this section in November, 1909, and again in July, 1910. At both times the surface was found to be in perfect condition and was of such a character as to provide a good foothold for horses. In addition to the experimental work of the commission, many of the French engineers have experimented with palliatives and many types of bituminous and cement concrete pavements. As many of these methods are used extensively in other countries, the description of the same will be deferred.

In Belgium, Italy and Switzerland, two types of construction are employed, namely, superficial tarring and a pavement constructed by the Aeberli system. The methods used in connection with superficial tarring are similar to those employed in France, in fact, they were adopted from the French practice.

The Aeberli system of constructing a bituminous pavement has numerous unusual features. First, by means of one machine, the broken stone is dried, cleaned and finally passed through a cold bath of crude tar. The tar-coated stone is then stored in piles covered with a blanket of sand 3 to 4 inches in thickness for a period of from three to six weeks, after which it is used in the ordinary way for the construction of a bituminous concrete pavement.

Hand pump spraying machine in operation at Camberwell, London, Eng.

Austria for the past five to six years has been experimenting with superficial tarring and various types of bituminous pavements constructed by the mixing method. The engineers, of Austria, in common with those of northern England and the United States, have to contend with the disintegrating effect of the blows from horses' hoofs shod with shoes provided with calks. Those of the Austrian horse are without doubt the most disastrous in their action on road surfaces, as the shoe is equipped with four calks instead of two, while the shape of the calk is that of a pyramid mounted on a prism. The resulting effect is that on warm days many bituminous surfaces are honeycombed with perforations.

In Germany, in addition to superficial tarring by hand and by various types of German machines and the construction of bituminous pavements of various types of the mixing method, the highway engineers have used very extensively both for city streets and trunk lines, subjected to intense motor-car traffic, a type of stone block pavement known as "kleinpflaster." The small stone sets are placed so as to form circular or parabolic arcs. The stone blocks are laid on a foundation of macadam or concrete, with a cushion coat of sand or gravel and with joints filled with sand or gravel and in some cases grouted. Laid in circular arcs, the joints of the pavement are continually broken from the standpoint of traffic resulting in a surface much smoother than ordinary stone block and not as noisy. A departure from the German practice is found in Hungary, where small square blocks are laid in straight rows forming angles of 45 degrees with the longitudinal axis of the road.

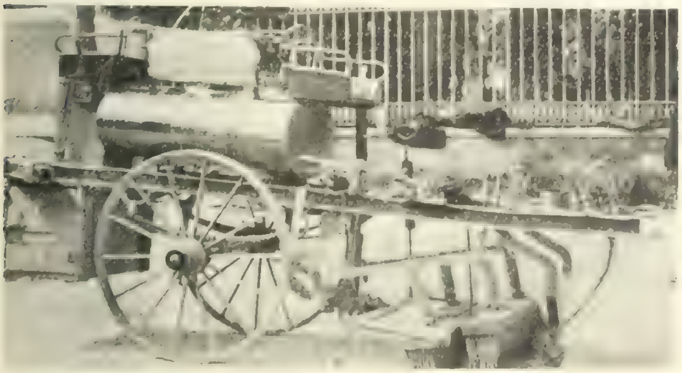
Granite trackway, Glasgow, Scotland.

The British engineers have expended large sums of money in the development of many types of bituminous surfaces and pavements adaptable to economical use on trunk lines subjected to heavy and intense traffic, and in some cases as a substitute for asphalt comprime and wood block on city streets. It is however, somewhat surprising to find the diversity of opinion which exists among British engineers, when it is remembered that, especially in England, bituminous surfaces and pavements have been constructed for many years. However, remarkable progress has been made both from the standpoints of construction and maintenance. At the Third International Road Congress to be held in London in 1913, many of the differences of opinion will without doubt be brought to a focus.

Another powerful factor which will tend to determine the relative value of many of the varying types of construction is the new Road Board of England, which controls the granting of government aid for the construction and maintenance of trunk highways. It must not be inferred that the writer considers that one remedy will eventually be found which will be applicable to all classes of roads subjected to all classes of traffic, but, as will be seen in the description of the various methods used, differences in practice exist which are susceptible of assimilation provided that comparative tests are made based on scientific principles.

Within the borders of England can be found a greater variety of methods of using tar in road construction than in any other country in the world. Proceeding from the simple to the complex, the first type which will be considered is superficial tarring. Hundreds of miles have been so treated, either by hand method or by various machines of the types used by French engineers, but of British design.

Two notable diversions may be found from Continental practice by a thorough investigation of English practice. One is the positive conclusion on the part of many engineers that the use of refined tar for a surface coating is economical and possesses many advantages over the use of crude tar. One advantage, which is appreciated by motorists, is that a road properly coated with refined tar can be opened to traffic within a few hours after treatment. Roads coated with crude tar, however, may have to be closed to traffic for two or three days. In connection with the use of refined tar, it is of interest to note that a number of British engineers feel compelled to use refined material from the standpoint of the danger of damages being claimed for the pollution of fish streams by the washings from a road surface treated with crude tar. The second difference is that the practice of some eminent English highway engineers is to omit the surface dressing of sand or screenings, as it is not considered either necessary or efficacious.



Lassailly gravity distributor.

The method of using tarred sand, gravel or chips, in both England and Scotland, in connection with the construction of ordinary macadam and bituminous pavements is worthy of consideration. The practice of many engineers is to use the fine tarred material as a filler, rather than as a carpet or coating, thus allowing the mosaic surface of the upper layer of macadam to take the wear.

The durability of the various types of bituminous concrete pavements constructed by the British engineers is remarkable, especially when the character of the intense and heavy traffic to which a large percentage of the mileage of this class of road is subjected is taken into consideration. This traffic, consisting of heavy motor vans, tractors and traction engines hauling, in many instances, from one to three trailers, is unknown in America and on the Continent.

Bituminous surface on macadam. Route Nationale No. 5, Melun, France.

Bituminous pavements have, of course, been constructed for many years previous to the twentieth century, but at present interest is centered on those types which have been used during the past ten years. Two methods have been used to a considerable extent, namely, the penetration method and the mixing method. Two modifications of the penetration method, as usually employed in America will be mentioned.

Pitchmac is constructed on a foundation of inferior stone, which has been flush-coated with bituminous material. On this foundation a layer of 1¼-inch stone, varying from 2 to 4½ inches in depth, is rolled in from one to three courses, a coat of bituminous material being applied to each course, while the surface is completed with a top dressing of chippings. The bituminous mastic used consists of pitch, creosote oil, fine sand and other ingredients. The writer, while in Liverpool, inspected many sections of pitchmac which had been subjected to severe traffic for many years, one having been down nine years, and in every case found the surface in excellent condition.

The other modification of the penetration method is the Gladwell system, which consists of first lightly rolling a thin layer of 2-inch stone in a bed of bituminous mastic, second, painting with refined tar and third, filling the voids of the surface with mastic, after which the pavement is rolled and at once opened to traffic.

In the mixing method of constructing bituminous pavements, English engineers have employed a great variety of mixers, some of which are very satisfactory in the results secured, judged from the standpoints of economics and the quality of the mix. Mixing ma-

"Durax" pavement under construction at Ilford, London, Eng.

[illegible] of both the batch and continuous types have secured the attention of British manufacturers. Unfortunately the limitations of the various machines built, in some cases, operating charges, etc., have not been ascertained.

A diversion from American practice is in the extensive use of slag since the first successful experiments were carried out fifteen years ago. Although Tarmac which is made of slag has its limitations, the English roads coated with a Tarmac surface are generally excellent in character.

In connection with the mixing method it should be noted that asphalt, either alone or in combination with tar and other materials, has been successfully employed in the construction of many sections of bituminous pavements.

The introduction of "Durax" as a substitute for wood block, asphalt comprime and even ordinary stone block, in some cases, has occurred during the past few years. Durax is simply the kleinpflaster of Germany, with the addition of a bituminous cushion between the foundation and the stone blocks and the joints filled with a bituminous mastic. The city of Birmingham furnishes many examples of Durax pavements, which have been under service for a number of years and are subjected to heavy and intense traffic.

Trackways of rectangular stone blocks, averaging 12 inches wide, 6 inches thick and of varying lengths, have been used for many years on steep hills or where the traffic is exceptionally heavy in some cities of England and Scotland. Trackways of both stone blocks and steel girders laid in ordinary macadam are now proposed by some foreign engineers as a solution of the problem of economically maintaining macadam roads subjected to motor-car traffic.

Throughout the Continent and the British Isles, improved roads have for many decades received the attention that their influence on the development of civilization justifies. On this side of the Atlantic, the highway engineers have since the early nineties, rapidly developed certain systems of highways, the total aggregate being, however, comparatively small. Moreover, the fact must be recognized that highway engineering as an applied science has, in many parts of Europe since the days of Tresagaut, MacAdam and Telford, occupied a more exalted position in the broad field of engineering than it has in America. It is not surprising, therefore, that to-day we should find in one European country, France, the most perfect system of macadam roads in existence, when considered from the standpoint of the average quality of all its roads, national, departmental and vicinal, and, that in another, namely, England, that the engineers have successfully constructed and economically maintained with dustless surfaces a larger percentage of the total mileage of its roads than elsewhere in either hemisphere.

With a heritage of thousands of miles of well-constructed macadam roads, maintained in many instances by systems of maintenance more or less approaching that ideal established by the French Department of Roads and Bridges, the opening of the twentieth century found the European engineers in an enviable position to cope with the problems imposed upon them by the advent of that new type of traffic, the swiftly moving motor car. From foreign methods of constructing and maintaining the various classes of dustless surface, the American engineer should be able to deduce many lessons of value.

In conclusion the writer will call attention to some of the characteristic features of foreign practice, which would advantageously be adopted in certain localities of America.

In marked contrast to the practice in many sections of America, especially in our municipalities, is the well-established custom of giving to one department complete control of the design, construction and maintenance of roads and pavements.

The responsibility for the solution of engineering problems in Europe is placed where it belongs, namely, on the chief engineer. If his first solution is not financially possible or advisable, another is requested, but with practically no interference on the part of laymen with the engineering features of the problem. As a direct result of the above custom, three commendable features of foreign practice have become well established in many countries.

First, the same thorough preliminary investigation is given to a road problem as is given to the design of a waterworks system or a sewage disposal plant.

Second, the rapidly developing practice, especially characteristic of the work of the leading municipal and county engineers of England, of constructing that type of surface or pavement which is economically adaptable to local conditions and environments.

Third, the development of economical systems of continuous maintenance.

One feature, characteristic particularly of the English and French systems of maintenance, is of special interest to the motoring public, namely, the development of economical methods of surfacing large areas with tar or other compounds at the beginning of the summer season. In France this means that the bulk of superficial tarring is done in May and June, while in England, due to the rainy season, the work extends into July. In connection with superficial tarring, it is interesting to note that the fact has been established, based on the best English and French practice, that it is possible to tar-paint macadam roads traversing woods without the subsequent formation of the black mud about which so much has been written.

A commendable feature of French and English practice is the construction of trunk lines with a greater width of the metalled surface than is characteristic of the American highway. This result, when considered in connection with the reduced cross-fall or crown, in a highway which is ideal from the standpoint of modern traffic and more economical in maintenance, due to the self-evident distribution of traffic over the surface of the road.

On the Continent and the British Isles, the fact has become well-established that it is economical within certain limits to use only road metal of the best quality for the surface, with the result that the greater part of the broken stone employed is hauled many miles, although broken stone of inferior quality may be at hand.

In one field of modern highway engineering, namely, the investigation of the effect of the various chemical and physical properties of bituminous materials on the adaptability of the materials for use in the construction and maintenance of roads and in the drawing of specifications covering these properties, the foreign engineers recognize that American practice is far in advance of European. The engineers on the other side of the Atlantic expect that the progress reports submitted by the engineers from Canada and the United States at the Third International Road Congress, in June, 1913, will contain valuable information relative to bituminous pavements and surfaces constructed and maintained with bituminous materials supplied under specifications.

The Construction of Broken Stone Roads

Advantages of This Type for Rural Highways—Approved Constructional Practice — Cost of Work in York County

By E. A. James, B.A.Sc., Chief Engineer York Highway Board

WHEN the magnitude of traffic demands a more substantial road than can be secured by any manipulation of the existing soil, and when heavy automobile traffic is not too severe, a road built of properly bound broken stone will usually suffice, and if well maintained will give many years of satisfactory service.

Some of the commendable features of a well built broken stone road are:—(1) a good foothold for horses; (2) ease of traction when kept in good condition; (3) comparatively low initial cost, particularly when material can be obtained in the vicinity of the road; (4) comparatively noiselessness.

The principal objections to broken stone roads are:—(1) unless the surface is treated it will be very dusty in dry weather; (2) unless the dust is kept swept off in dry weather there will be considerable mud in wet weather; (3) high cost of maintenance under heavy traffic; (4) difficulty in keeping clean.

Mr. E. A. James

While these objections hold good against this class of roads as adapted for city streets, they are negligible in the case of rural highways, and it can be safely said that with proper construction and maintenance they constitute the cheapest and most comfortable type of the better class of rural roads. Their cost renders them prohibitive except on main travelled roads. The less important roads must still be constructed by one of the methods previously described.

The construction of broken stone roads dates back to 1764 when a system of improved pavements was begun in France by M. Tresaguet. In England a similar system was started and carried on early in the nineteenth century by John Loudon Macadam and Thomas Telford, whose names are still associated with the two forms of construction which they advocated. The introduction of the steam roller and of improved machinery for crushing stone has greatly increased the efficiency of roads built after these forms; otherwise the principles now followed are as laid down by them. The principles most emphasized by both these road builders were, the thorough drainage of the sub-soil, the use of stone broken to a given size and the formation of a uniform cross-section with enough crown to allow rain water to flow off the road to the sides instead of in a longitudinal direction.

The difference between the two systems may be briefly stated as follows:—Macadam shaped the sub-grade to conform to the cross-section of the finished road, in this respect following the method of Tresaguet. On this sub-grade broken stone of a size corresponding to 1½ in. or 2 in. was placed in a layer of uniform thickness to a depth of from ten to twelve inches. Telford's sub-grade was made level and a course of large flat stone, set on edge, was placed by hand. The stones were so graded that the highest ones, about 7 inches deep, were placed at the centre of the road and tampered gradually to a depth of three inches to the sides. These stones were wedged together by smaller stones and stone chips, to form a firm, unyielding base. On this was spread a six-inch layer of small broken stone, the first four inches being consolidated by traffic before the final two inch layer was added. The base of large stones was also common to the method adopted by Tresaguet.

When the sub-grade is inclined to be soft or when traffic is extraordinary heavy, this foundation of large stones is to be recommended. Its cost however makes it prohibitive in other than exceptional cases. Under ordinary conditions a road built on the principles outlined by Macadam will suffice.

The modern method of constructing a macadam road is as follows:—The sub-grade is shaped to conform to the finished cross-section and sufficient drainage provided. The sub-grade is then thoroughly rolled, and all low spots are filled with earth and rerolled. This is continued until the sub-grade is hard and compact and of a cross-section similar to that of the finished road. Shoulders are formed to prevent the stone spreading to a width greater than desired. On this prepared sub-grade is placed a layer of stone about six inches thick. If the finished road is to have a depth of six inches or less, the stone may be rolled a single course. If, however, a greater depth is required, it is found economical to roll a first course

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of five or six inches, and after it has been compacted, to add the second course to complete the required depth.

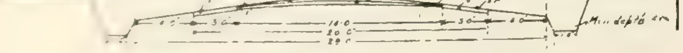
The stone is rolled until the roller passing over it makes no impression and until the stone ceases to creep ahead of the roller. The sooner this can be accomplished the better. Too much rolling, particularly in the case of the softer rocks, wears the sharp edges off the fragments, and it is these sharp edges that play an important part in the stability of the road. Sprinkling the stone just sufficiently to dampen it will materially assist in the consolidation. The addition of a small quantity of fine sand or screenings will often accomplish the same result.

Either of these processes is beneficial if that consolidation is attained with less movement of the stone, and consequently with less rolling.

When the top course is compacted, a binding agent is applied in the form of fine fragments of stone—usually the fine material which is screened out at the crushing. This is applied in such quantity that there is just a slight excess over the quantity required to fill the voids in the top of the stone. From a theoretical view-point, it is not necessary to have the voids completely filled to the bottom, as the main purpose of this binder is to prevent the movement of the stone on top. Theoretically, the stability of modern macadam road depends on the following points. The stone is rolled until each piece is wedged between those adjacent. The binder is added to fill the voids in the top and so prevent further motion of the stone. As long as the particles of stone do not grind on each other, there can be no wear on the road material except on the surface. Therefore, while sufficient rolling is essential in order that the whole mass may be made as compact as possible, the success of the road will depend on the way in which the top stones are held in place, and this in turn depends on the success with which the binding is accomplished.

Binding

The successful binding of a macadam roadway depends rather on a combination of conditions than on any single one. If a statement of the key-note is insisted on it may be termed the thorough performance of everyone of a number of operations. These operations, everyone of which must be satisfactorily performed are as follows:—(1) thorough drainage of subsoil; (2) thorough rolling and compacting of subgrade; (3) rolling of metal until thoroughly compacted, i.e., until no movement of particles occurs when roller passes over it; (4) addition of a proper quantity of binder—neither too much nor too little; (5) addition of sufficient water to make a slurry; (6) sufficient rolling to work up the slurry and force it into the voids in the stone.



General cross-section of improved roads.

The action of the binding material in macadam road-making is a genuine cementing action. The powders of many varieties of rock have the property of cementing together to a greater or less extent on the addition of water. This property is most marked in the case of limestone, which explains the popularity of limestone as a binding material. There is even a difference in the cementing qualities of limestone from different localities. Generally speaking, it may be said that this cementing action is strongest in amorphous limestones, decreasing where there is any tendency toward crystallization.

The theory of the cementing action is as follows:

Finely powdered crushed stone with which is mixed "dust of fracture" and to which water has been added possesses the property of setting and hardening to a certain extent, just as does cement, though of course to not nearly the same degree. It is important that there be a certain quantity of the dust in the finely broken stone, otherwise binding will be slow.

The roller passing over the top or binder coat pulverizes most of it, and with sufficient rolling reduces some to dust. If there is no dust to start with the binding will be delayed till the roller has crushed sufficient of the coarser particles to produce dust. Rolling is continued, with the addition of sufficient water to form a "slurry." At this point actual binding begins and rolling should be continued till the slurry has been worked into all the crevices and there is still a small amount on top. There should always be enough to form a small wave ahead of the roller **and no more.**

Limestone macadam, Unionville, Ont.

During the rolling, the working up of the "slurry" and the depositing of it in the voids is assisted by continual sweeping with stiff stable brooms. This forces the slurry into all the crevices and assists in making a surface which when finished will be practically impervious to water.

If the grit be applied in too large quantities it has a tendency to act as a cushion under the roller, and the grit is not properly worked into the stone, nor does the slurry get a chance to penetrate as it should.

The amount of water used should be sufficient to work up the slurry mentioned, but beyond this care should be taken. The speed with which binding may be satisfactorily accomplished depends largely on using just proper amounts of grit and water—enough for their purpose and no more. If too little grit be used the voids in the stone will not be filled and the water will penetrate and soften the sub-grade. If too much grit is applied the cushion will occur as above mentioned and the slurry will not penetrate where it should. If too little water be used the slurry will not work up properly and can not set. Too much water is liable to work to the sub-grade and soften it. This point should always be remembered—to satisfactorily finish a macadam surface, the water must not be allowed to penetrate the sub-grade, otherwise it cannot remain firm, and firmness of sub-grade is one of the basic principles of macadam road construction.

After binding as above described, the road should be closed to traffic for a few days, in order that it may thoroughly dry out and the binder set hard. Warm sunny days are best for this stage of the work. In fact one objection to macadam construction in late fall is the failure to harden as it should, due to scarcity of suitable drying weather. Similarly, work should not be started too early in the spring, as the ground should be quite firm and dry before any attempt is made to run a heavy roller over it.

The stone most suitable for macadam roads is one in which hardness and toughness are combined. Mere hardness is not desirable as the stone may be so brittle as to break under ordinary traffic. For roads where the traffic is exacting it will be found economical to use the best stone obtainable even at increased cost as the decreased annual cost of maintenance will soon effect this.

Undoubtedly the most suitable rock for road construction is the variety covered by the general name, trap. This includes diabases, diorotes basalts, and some other dark-colored, fine-grained igneous rocks. Some dark-colored granites, when not too coarse grained, and some felsitic rocks, give excellent results. Some of the harder varieties of limestone are acceptable if other rocks are economically possible. Field stone, provided all weathered and porous stones are sorted out, when crushed to the regular size often gives fair results, the main objection to this stone being its lack of uniformity in texture. Some granite gneisses have also been used successfully. Among stones which should not be used are sandstone and quartizite (cohesion is low), slates, schists and micaceous granite. Some of these stones, however, may be used for the bottom course, using for the surface course a better grade.

The width of macadam road required for any locality will depend entirely on the intensity of traffic. For economic reasons it should be no wider than sufficient to accommodate comfortably the maximum traffic which may be expected to occur during the life of the road. Usually the width should be increased as the road approaches large centres of population, until at the outskirts of a city it should be at its maximum, This maximum for a rural road may be placed at eighteen or twenty feet. For localities where traffic is lighter the width may be reduced to nine or ten feet. In such cases it is economical to construct a narrow macadam roadway and pay more attention to the earth shoulders. These may be kept in good condition by the use of the log drag.

When a macadam road is built with a gravel or stone road as a foundation, it is advisable to loosen the old material either with a scarifier or with the steel picks supplied with the roller. This serves the double purpose of rendering the bottom less hard, so that the new stone is not crushed between the bottom and the roller, and also of enabling the new material to knit into the old forming one continuous layer instead of two thinner ones.

Cost of Macadam Roads

The following examples show the actual cost in two cases of constructing the stone surface of macadam roads in York County.

(a) Length of road, 8½ miles	45,000 feet
Width of metal	14 feet
Thickness of metal	7 inches
Average haul	½ mile

Material, granite, cost $1.75 per ton or $2.27 per cubic yard.

Stone and grit (17,196 cu. yds.) ..	$39,122.44
Labor	9,576.50
Teams	5,771.93
Fuel, oil, etc.	902.90
Total	$55,375.77

This is at the rate of $6,514.50 per mile of 14-foot road, $0.791 per square yard, $3.22 per cubic yard.

(b) Length of road	25,000 feet
Width of metal	10 feet
Thickness of metal	6 inches
Average haul	1 mile

Material, limestone, costing $1.30 per ton or $1.69 per cubic yard.

Stone and grit (5,320 cu. yds.) ...	$9,000.00
Labour	2,873.03
Teams	2,433.33
Fuel, oil, etc.	320.00
Total	$14,636.36

This is at the rate of $3,230 per mile of 10-foot road, $0.53 per square yard, $2.75 per cubic yard.

An Interesting Building Extension

THE 75 x 75 ft. ten-storey office building of the Fidelity Trust Company, at the corner of Charles and Lexington streets, Baltimore, was recently enlarged by the addition of ten new upper storeys and by the construction of a new 25 x 75-ft. addition on Lexington street and by a 100-ft. addition on Charles street, forming with the old structure a 100 x 125-ft. building eighteen storeys high.

The 18-storey addition forms a structurally independent L-shaped building containing about 2,000 tons of steel which was erected by an average force of 50 men with one guy derrick and one stiffleg derrick set opposite the two street fronts and together commanding the whole area of the building.

While the new structure was in course of construction the two upper storeys of the old building were vacated and the old building torn down to the eighth floor level without interfering with the tenants below the ninth storey, who were undisturbed throughout the entire progress of the work. This part of the building contained forty rectangular cast-iron columns supporting single and double I-beam floor girders. They were efficient for this service, although not competent to carry additional loads, but as their foundations were investigated and found to be adequate to support not only their original loads, but those from the ten new storeys, they were retained in service and unchanged except for the reinforcement required to carry the upper ten storeys. This reinforcement practically consisted of special new columns enclosing the old columns, without receiving any of their loads or transmitting any loads to them and serving for the independent support of the upper storeys on the original foundations.

In order to enclose the old columns with sufficient clearance for connection and splices the new columns were made 20 in. square, and each consisted of four 6 x 6-in. angles, with the flanges turned inward and latticed on all sides. They were made in single-storey lengths and spliced, with cover plates shop-riveted to the flanges of one section and field-riveted to the other section at all storeys.

It was at first proposed to shop-rivet the lattice bars and cover plates to each opposite pair of angles, thus forming channel-like sections with latticed webs, which were to be assembled on both sides of the columns and have all of the lattice bars on the two remaining sides field-riveted in place. To minimize field-riveting, this plan was modified by shop-riveting the lattice bars of two of the adjacent sides to three of the corner angles and shop-riveting the lattice bars of the remaining two sides diagonally opposite to the third corner angle. This reduced the original four rows of field-driven lattice rivets to two rows, and they were eventually replaced by turned bolts, with the nuts on the outer ends. The 4-in. clearance between the old and new columns permitted the bolts to be inserted from the inside, and although they fitted tightly in the holes it was possible to push them through far enough for the nut on the other flange of the angle to engage one or two threads; after which the bolt was pulled through and held firmly by screwing up the nut.

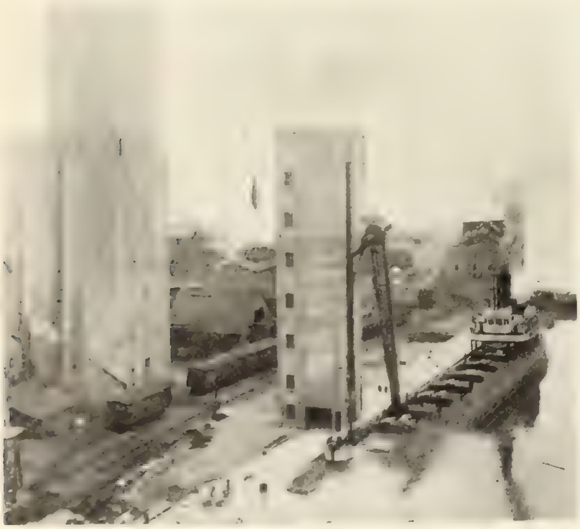


Fig. 1—Marine tower at Goderich, Ont.

The twelve columns in the main banking room were reinforced without any interruption to the banking business, operations being commenced after the close of business Saturday afternoon and carried on over Sunday and a Monday holiday, completing the work before office hours Tuesday morning, when the new steelwork was left covered with burlap until the final casing was applied by another contractor. Elsewhere in the old building the column work was executed at night without disturbing the tenants. The total weight of column reinforcement was 110 tons, which was erected in three weeks. The steel work was fabricated by the Baltimore Bridge Company, Mr. H. D. Bush, manager. It was erected by Mr. T. E. McAvoy, New York, who planned and supervised the work with Mr. Bush.

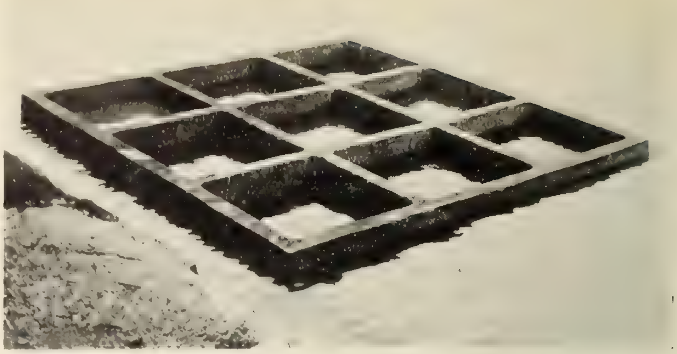


Fig. 4—Caisson resting on bed.

Elevator Construction at Goderich, Ont.

By J. H. Tromanhauser, Toronto

THE most recent equipment provided in Canada for unloading grain cargoes is shown in Fig. 1. This shows a marine tower built by the writer during 1912 for the Western Canada Flour Mills Company, at Goderich, Ont. The tower building, from the rock bottom of the harbor to the roof, is in concrete, with interior frame of steel. The marine elevating machinery has a capacity of 25,000 bushels of wheat an hour and the marine shovel machinery has several new features.

While the rapid unloading equipment of this tower is its chief feature, the method employed in carrying the foundations down to the rock bottom of the harbor,

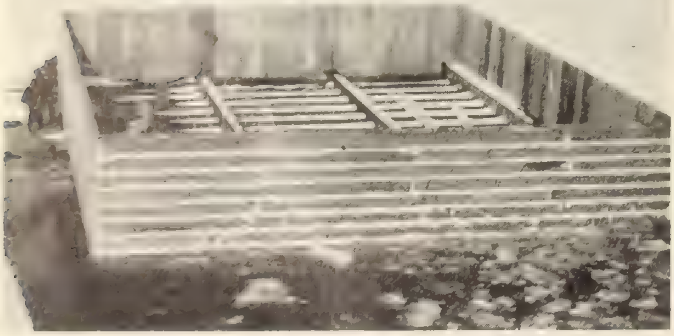


Fig. 2—Wooden water-tight pontoon.

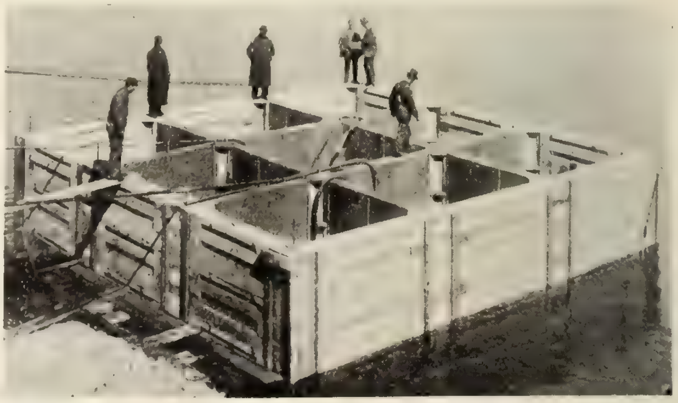


Fig. 3—Sinking concrete caisson.

through 25 ft. of water, is a matter of interest, owing to the fact that the work was carried out on entirely new lines.

The tower building, which is 26 ft. square by about 130 ft. high above the dock, was set out in open water, about 25 ft. deep. The rock bottom had been blasted and dredged previously to a rough general level. The site was then carefully sounded and the depressions in the rough dredged bottom were filled by dropping coarse gravel and small stones through the water into the holes until the filling was brought up to the level of the highest irregularities of the uneven rock. Upon this level bed there was sunk a reinforced concrete crib or caisson, 30 ft. x 30 ft. square, by about 26 ft. deep, built with nine 10-ft. square compartments.

The outer walls of the caisson were 12 in. thick, while the inner cross walls were all 10 in. thick. The caisson was built floating on a water-tight pontoon bottom (Tromanhauser's patented system) and when completed was towed to position and sunk on the prepared berth, by admitting water into its compartments.

Fig. 2 shows the wooden water-tight pontoon being launched into a hole cut through the ice upon which the pontoon was built. Fig. 3 shows the concrete caisson floating in the water while being sunk upon the harbor bottom. Fig. 4 shows the caisson resting on its bed. (Note the exact level at which it settled down to position.) Fig. 5 represents the caisson with its filling, piling and top concrete slab, all complete, ready to receive the superstructure of the tower.

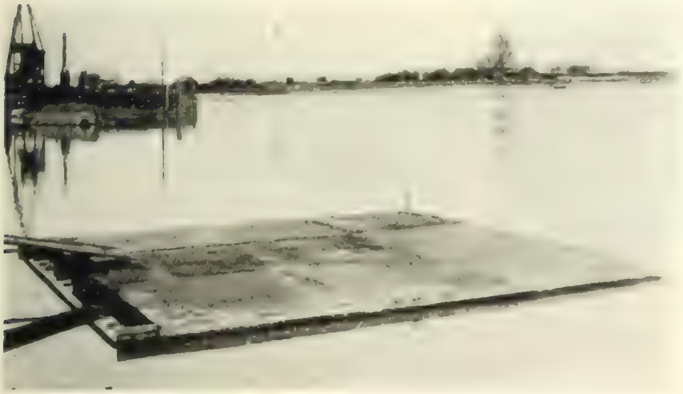


Fig. 5—Completed caisson, ready for superstructure of tower.

After the caisson was sunk upon the harbor bottom, its compartments were partly filled with sand and gravel. Through this filling and the plank bottom of the pontoon, wooden piles were driven to support the tower structure. The piles were cut below water and the filling was completed to about the level of the pile heads. Over all was put the heavy concrete slab.

So far as is known, this is the first instance of work of this nature having been accomplished in this way, and it would appear difficult to produce a job of equal quality by any other method of construction now in use.

THE extension of the reinforced concrete practice to the production of posts for fencing has gained immediate favour amongst several of the British railway companies. The advantages offered are also being appreciated more fully day by day by the owners of big estates. The difficulty of producing a wooden or ordinary metal post that does not rapidly deteriorate in sodden ground is generally recognised. Even to give wood a moderate life under such circumstances requires tedious treatment and a considerable expenditure. There is always the risk of fire and of mutilation by malpractice. Reinforced concrete neither rots nor burns. On the contrary, it is claimed that posts made of this material are benefitted by wet or sodden ground, as the moisture assists the chemical action which takes place in the hardening of the Portland cement. Appearance is a matter to which strict attention is now being paid. Wooden and plain metal fences cannot rival reinforced concrete in this respect. The latter are cast neatly and almost to any design, and retain their appearance practically without deterioration.

BAKED sulphate of iron, which is used in connection with lime as a coagulent for the water supply of St. Louis, Mo., is broken up by a newly advised apparatus described in the report of Mr. Edward E. Wall, water commissioner. During the year 8094 tons of sulphate of iron and 12,665 tons of lime were used in clarifying 33,864,000,000 gallons of water. The breaker for loosening the caked sulphate of iron consists of a horizontal girder supported from the bin roof, geared to make two revolutions per minute when driven by the reclaim conveyor motor, and carrying a heavy chain the length of which is adjusted so that it scrapes over the surface of the cemented sulphate. The chain loosens the iron so that it is no longer necessary to send men down into the bin, but at times the lumps are so large that they will not pass through the chute leading to the conveyors and must be broken by poking through bar holes in the conical bottoms of the large storage bins.

INTERESTING details are to hand concerning a new process for protecting iron and steel from corrosion. An alloy of zinc is electrolytically deposited on the surface of the iron or steel to be protected from corrosion, which is more durable than coating with zinc alone. The great drawback is that it is so readily attacked by weak alkalies or acids. The resisting powers to corrosion with zinc-iron alloy has already been established in connection with the process of "Sherardising," which consists of forming an alloy of zinc and iron on the surface by bringing iron or steel in contact with zinc dust or powder, at a temperature considerably below the melting point of metallic zinc. The new process of ferro-zincing or ironising is claimed to have the advantage that articles of almost any size can be coated, and it is cheaper and more efficient than hot galvanising. As the process is a cold one there is no distortion.

AN article by Mr. E. B. van Deman, in the American Journal of Archaeology, gives an interesting account of works executed by the Romans between the years 750 B.C and 300 A.D. According to the writer, concrete first came into use about 200 B.C., when it was employed chiefly for foundations, and as the basis of decorated surfaces. About the beginning of the Christian era, however, it became the principal building material, and in the reign of Augustus Caesar its use was nearly universal, and facings of concrete were quite common. In the reigns of Trajan and Hadrian the concrete mortar was of excellent quality, which was not maintained in later times. The article is well worth perusal and shows that the writer has made a careful study of constructive work carried out during the ages mentioned.

Evolution of Road-Building Machinery

Continuous Improvement in Design—Present Tendency Toward Use of Heavier Equipment Grading Machines, Steam Rollers, Crushers, Traction Engines, etc.

By **W. A. McLean**, Provincial Engineer of Highways for Ontario.

THE cost of road building is made up principally by the cost of labour. Expenditure for materials in their natural state, and for equipment, is comparatively small. Gravel in the pit, stone in the quarry, cost very little. The chief outlay is for excavating gravel and hauling it to the roads; for quarrying the stone, crushing it, teaming to the road, spreading and rolling to place. Grading, ditching and draining are all matters of labour. The purchase of road-making equipment, crushers, rollers, engines and wagons, costs a considerable sum it is true, but distributed over a series of years, and the total length of road on which they are used, the cost of equipment per mile is comparatively little, as compared with the cost of operation, teaming, and manual labour involved in the construction of a road.

The present age is distinguished as an age of machinery, and the tendencies which are at work to displace the manual by the mechanical, in manufacture and production, and in all other fields of construction, are evident in respect to road-making.

Mr. W. A. McLean*

Road-making equipment and appliances have been steadily growing in number and improving in design. With the increasing cost of manual labour, and its decreasing efficiency, there has been a growing advantage in the employment of machinery. Ten years ago, in the townships of Ontario, men could be had for $1.25 a day, and teams for $3.00 or $3.50. Last season the ordinary price was $2.00 or $2.50 a day for men and $5.00 a day for teams. In individual cases wages were higher. Complaint is general that, with the higher cost of labour, there is a tendency for men to do much less work, all accruing to the advantage of using labour-saving equipment.

In order that machinery may be used to best advantage, it should be kept constantly employed, and on long stretches of work. If left idle for a considerable portion of the year, interest on the investment, and depreciation of value, are an off-set to the economy of its use. If used on short stretches only, the cost of moving from place to place, and the consequent delay and disorganization are a detriment. With the growing need for good roads, their construction must be taken out of the stage of patchwork, and made "a man's job."

The supervision and direction of road-making, involving the use of a considerable amount of machinery, is thus demanding a large amount of mechanical ability. Road superintendents and foremen who do not understand machinery and mechanical principles, are not likely to achieve the highest success, and will work under a great disadvantage. A practical knowledge of machinery, and skill in its operation, are becoming necessary qualifications for road management, and with the lessening need for manual labour there is a growing demand for machinery operators.

The machinery required in any locality for road-making will depend principally on local conditions, and the circumstances under which the work is being done. The list of machines and tools is a lengthy one, but as a rule, only a few of these will be needed under any definite set of conditions or for a given work. In some districts, stone can be quarried and crushed in the immediate locality of the road; in other cases, it will be shipped in by rail; in some cases gravel is used; a bituminous, concrete, or other form of road will require special types of implements.

Road graders are among the oldest and most generally used of road machines. Nearly every township in Ontario has at least one; some have as many as four. Their use is least in districts where rock comes to the surface, and the land rough and broken; and they are of greatest value in purely agricultural districts of uniform clay, loam and sandy soils.

The present tendency is toward the use of heavier grading machines; and drawn by steam tractors, where the work can be performed in long stretches. The value of grading machines depends largely on the skill of the operators. An experienced man can do better work and at much less cost than one who is inexperienced. And in the hands of men who do not understand the principles of road-building, a vast amount of injury has been done by the misuse of these machines—particularly in cases where long stretches

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of old gravel roads have been covered with sand and earth drawn in from the shoulders. These old neglected gravel and stone roads should be restored by throwing the earth shoulders away from the gravel, using the grader to deepen the gutter or drain. Earth and sods on top of gravel and stone, merely turn to dust and mud, and ruin the stone foundation.

Steam Rollers

Steam rollers are a necessity wherever broken stone roads are being built. To leave stone in long, loose stretches on the roadway is an obstruction to traffic, a practice that is wasteful, and one which cannot produce a good macadam road. A steam roller will save its cost in the saving of stone, in the greater durability of the road, while the users of the road will find it a pleasure instead of a hardship to drive on it. When first built, the road is at its best instead of at its worst. Ten-ton rollers are best for ordinary country use. Heavier rollers are an additional strain on weak bridges, and are less easily handled on soft roads, especially in rolling the earth sub-grade. Horse rollers are very little used. Gasoline rollers have recently been introduced, but the difficulty of securing competent operators, and the increasing price of gasoline, have been temporary obstacles to their use.

The ability of the roller operator will influence greatly the cost and quality of the road. An expert can so compact the sub-grade, and consolidate the stone, as to use a minimum amount of the latter material, and the completed road will be true to form, with a uniform crown and shape. An inexperienced man, or one who is careless, can drive into the mud uselessly, a lot of broken stone, and leave a very inferior surface, uneven and lacking in uniformity.

Rock crushers are of two main types, the gyratory crusher and the jaw crusher. Gyratory crushers are most suitable for stationary work in a permanent quarry, but are not fitted for temporary road work, where a portable machine is desired to move from place to place. Jaw crushers are of two kinds, those of the cam-shaft and roller type, and those of the Blake pattern. The Blake machines have the advantage of greater simplicity, while the cam-shaft and roller design gives greater crushing capacity in proportion to weight.

Stone Crushers

Stone crushers of a portable type, for general use in a municipality should have a capacity of about 100 cubic yards of 2½-inch stone a day. Smaller crushers are, for ordinary road construction rarely found satisfactory, as they delay too much the season's work of road-building, and the cost of operating a small crusher is nearly as great as of operating the larger size. In carrying on roadwork, the crushing plant should be so manned and organized, that the crusher will be kept constantly full and at work. When the crusher is fed to the limit of its capacity, and the wagons are getting the stone to the roads, the best economy of operation will be reached.

The stone crusher should be equipped with an elevator, rotary screen, and loading or storage bin. Bins with chutes may be built out of plank; or mounted on wheels, and readily portable, may be purchased from the road machinery manufacturers. Bins are a necessity for economical operation, and without them, the time of teams and teamsters is wasted. The screen should be adapted to the material being crushed. If limestone, it is sufficient to separate the material into three grades; such as will pass a one-inch ring; such as will pass a 3-inch ring; and tailings, or material refused by the three-inch ring. If granite or trap is being crushed, a fourth grade, dust, should be separated, for use on top of the road; and the other grades may be 1¼-inch, 2½-inch, and tailings. The several sizes, when taken into the wagons through shutes from its compartment in the bin, are loaded at minimum cost, and may be placed in their proper position in the road.

Traction Engines

Traction engines, or steam tractors can be used for a variety of purposes:—for hauling a grader, operating a crusher, moving equipment from place to place, and for hauling broken stone or gravel. Many municipalities rent traction engines from owners of threshing outfits at a very reasonable rate. For all purposes of road-making an engine should be fairly heavy and powerful; and in this connection the difference between a "traction engine," and a "steam tractor" should be observed. A traction engine is intended chiefly for stationary purposes, but is equipped to move from place to place under its own power and draw a moderate load. A steam tractor is one which is especially built for hauling purposes, having the necessary weight and power. Wide driving wheels are of advantage in moving over earth roads. For road-building purposes, the "steam tractor" should, in general, be purchased, as it can be put to the greater variety of uses.

Wagons of good design for spreading are an important feature. Boxes holding a yard and a half or two yards, are suitable for team haulage. A new type of wagon of 3½-yard to 5-yard capacity, is being offered, for haulage by steam tractors. On good roads, and in level country, the cars of large capacity may be serviceable, but they lack the flexibility of smaller wagons, which can be handled either by horses or traction engines, and with less dependence upon the condition of the roads. Traction haulage, displacing horses, has various advantages, and for hauls of two miles or over show distinct economy, in cases reducing by one-half the cost of hauling gravel and stone.

Steam hoists or cranes for unloading stone from cars are proving of value. The unloading of cars as commonly carried on in summer is hot, laborious work, which men are inclined to shirk. To empty stone from cars by means of a steam hoist, does away with dependence upon men, and saves the time of teams wasted while the wagons are being loaded. A steam hoist, facilitating the handling of stone in a quarry, will permit the placing of crushed material in stock piles, and permits quarrying during the winter if desired.

Concrete paving, or concrete road foundations can be most rapidly built by means of a mixer moving under its own traction, and with an arm and bucket for depositing the wet concrete in place.

Additional Equipment

Road making equipment may include numerous additional implements:—a derrick in the quarry to replace horses and carts; steam drills; sprinkling wagons (with gasoline pumps) for wetting the stone before rolling; a motor truck for handling stone or gravel, particularly for repairs; pick plows, wheeled and drag scrapers, picks, shovels and miscellaneous tools. The use of bituminous materials involves equipment for heating, and applying the tar or asphalt to the road; and special materials, such as sheet asphalt, or bitu lithic, require an elaborate plant for heating and mixing, with special appliances for laying.

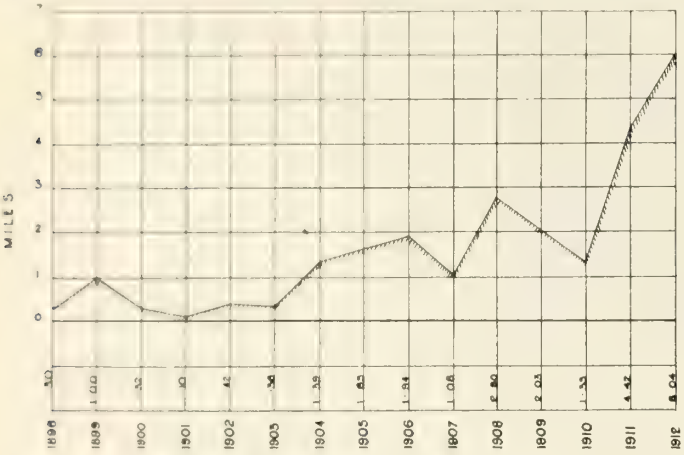
The art of road-building and paving, as will be seen from the foregoing brief review, is becoming largely a matter of handling machinery and tools, in which practical knowledge, experience and skill play a most important part. The care of these implements, their adjustment, cleaning, oiling, storage and protection, are in the highest degree important. A good workman is generally known by the condition of his tools, and well-kept plant and equipment are often indicative of the ability of the road foreman or superintendent.

Asphalt Paving Construction at Ottawa

By L. McL. Hunter*

THE real impetus to asphalt paving work in Ottawa was not felt until 1906, when several contractors started business in pavement work. Since that year the mileage has fluctuated considerably. In 1907 it was down as low as 1.08 miles and in 1912 it reached 6.04 miles, this being the highest mileage reached in one year in the city of Ottawa. The graphical sketch plan reproduced shows the pavement fluctuation from 1898 to 1912.

Pavement work in Ottawa is all carried out on the local improvement plan, either by petition or by the powers of Section 9 of the Municipal Act. The petition must be signed by sixty-six per cent. of the property owners before the work can go ahead.



Pavement fluctuations, 1898-1912.

In 1912 there were four companies doing business in asphalt paving work in the city, viz.: The Barber Asphalt Company, Union Construction Company, Ottawa Construction, and The Civic Asphalt Plant.

Owing to the keen competition between the above companies, the price per square yard of pavement has been reduced as low as $1.89. At the present time it wavers between $2.15 and $2.28 in the face of substantial increases in costs of labor, material and teams. The following table shows the various increases.

	per day
Labor, 1906	$1.80
Labor, 1912	2.16
Increase	$0.36
Teams, 1906	$4.00
Teams, 1912	5.40
Increase	$1.40

Material increase is 20 per cent. over 1906.

Practically nine-tenths of the asphalt work done in Ottawa has been of the genuine Trinidad Pitch Lake Asphalt. This has given every satisfaction to the city authorities. The asphalt is composed of 39.3 per cent. bitumen; 27.2 per cent. mineral matter; 3.3 per cent. water, hydration clay. When heated to 325° F., the loss of water, etc., amounts to 29 per cent. The characteristics of the Trinidad asphalt are (1) homogenous; (2) not emulsified; (3) dull chonoidal fracture; (4) no lustre color; (5) blue black in powder; (6) asphaltic odor; (7) softens and flows below temperature of boiling water, becomes liquid at much higher temperature about 300° F. The mineral matter contained in it is fixed and constant and is especially valuable as it forms a natural filler.

For residential streets in Ottawa the practice has been to use a six-inch concrete foundation composed of one part Portland cement, three parts clean, sharp sand and six parts broken stone (1:3:6). The concrete is laid to conform to the proper camber of the roadway. On main thoroughfares the depth of the concrete is increased, depending of course upon the amount of traffic to be encountered. Under street railway tracks the concrete is increased in depth to eight and twelve inches. The twelve inches under the tracks has only been used once, and that was on Sparks street—the main thoroughfare of the city. A section of the Sparks street pavement is reproduced and the illustration also shows the proposed manhole for the conduit system to do away with the overhead wires on that thoroughfare. Trinidad Pitch Lake asphalt was used on this street.

On every pavement laid in Ottawa a binder or cushion is called for in the specification to save the asphalt from the pounding traffic. This also acts as a bond between the concrete and asphalt and prevents any tendency of the latter to creep. This is vital to a pavement as during very hot weather the surface coat is very liable to get into a soft and plastic condition which, with the traffic usually pounding the

Sparks Street, Ottawa, an asphalt-paved thoroughfare.

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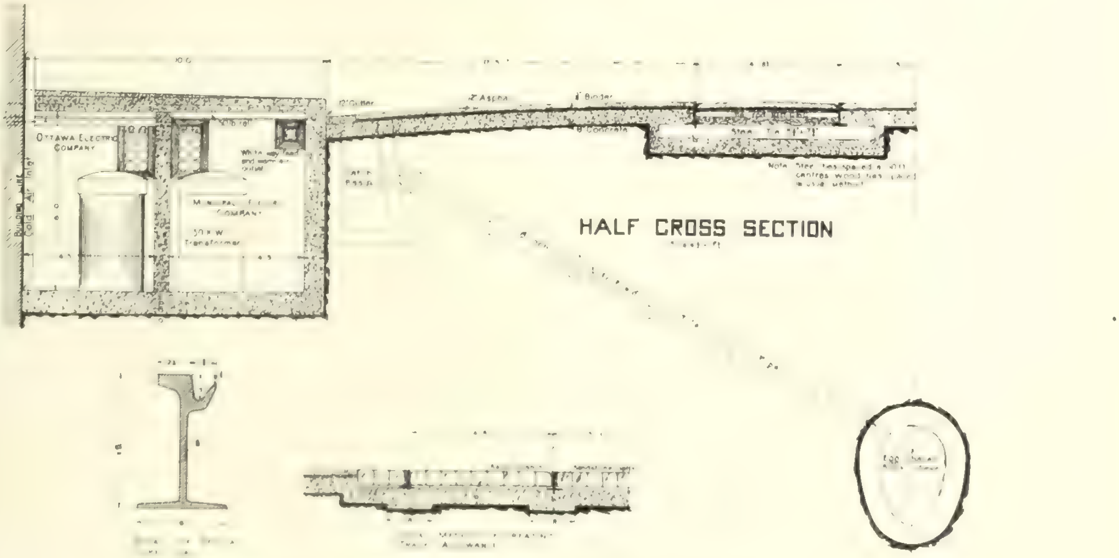
*Of the City Engineer's Department, Ottawa.

crown of the roadway, is apt to shear the asphalt towards the gutter.

The surface mixture is now prepared with all due care regarding sand grading, penetration of asphalt cement and quantity and quality of the artificial filler. Samples of all these materials have to be submitted by the contractors to the City Engineer.

Great attention is paid to the grading of the sand and it is frequently tested by the city officials with screens from a 200-mesh down to a 10-mesh, in order that a sufficient amount of fine, medium and coarse sand may be used in the mixture; so that, after the artificial filler and asphalt cement have been added to the sand, the mixture, after compression by the steam roller, practically contains no voids and is a solid homogenous mass. This is regarded to be of the utmost importance.

The artificial filler is either composed of limestone dust or Portland cement and is included in the mixture to fill any voids between the sand and asphalt cement, and also to give body and stability to the surface. An asphalt filler must be used which contains 70 per cent. of an almost impalpable dust, and the same amount (70 per cent.) must pass through a 200 mesh screen.



Sparks Street details. Pavement and conduit system.

In the city of Ottawa specifications the following proportions (by weight) are required. Asphalt cement, 12 to 15 per cent.; sand, 83 to 70 per cent.; pulverised carbonate of lime, 5 to 15 per cent. This is for Trinidad Pitch Lake asphalt.

For Bermuda asphalt the proportions are:—Asphalt cement, 9 to 16 per cent.; sand, 88 to 74 per cent.; pulverized carbonate of lime, 3 to 10 per cent.

During the coming season a large amount of paving work will be done. Plans and surveys have been made already for about four miles, and most, if not all will be constructed of asphalt.

A locomotive coaling station of reinforced concrete of 2,000 tons capacity, has recently been built for the Philadelphia and Reading Railway at Philadelphia. The building, which spans seven railway tracks, is supported on seven rows of five columns each, and one end row transversely, the rows of columns being parallel to outer lines of tracks.

Crushing Tests of Brick

SOME interesting experiments have been made at the Seger-Cramer Laboratory, Berlin, which go to show that special care is needed in carrying out crushing tests on bricks. This work is usually entrusted to testing stations of good repute, but these are not always acquainted with the special precautions which are necessary in the case of bricks.

As the portion to be crushed must be as nearly cubical in shape as possible, it is usual to divide a brick into two portions, and place one on the top of the other, cementing them firmly together before testing. The bricks must be sawn in two with a saw or an emery wheel; to use a chisel produces irregular edges, and by jarring the material, reduces its strength.

The material for joining the two portions is usually cement, others not having proved quite so satisfactory. Yet, whilst great care is taken in many ways, there is no agreement amongst those carrying out the tests as to the standard thickness of the cement layer between the pieces of brick, and the length of time which must elapse in order that the joint may properly harden.

As the result of the experiments referred to, it was found that, provided the joint is made sufficiently thin, and in no case more than one-twelfth of an inch thick, no appreciable difference in strength is noticeable between bricks kept for five days and those kept for a month. When thicker joints are employed, the cement takes longer to harden, and the quantity of it has a serious effect in reducing the apparent strength of the brick.

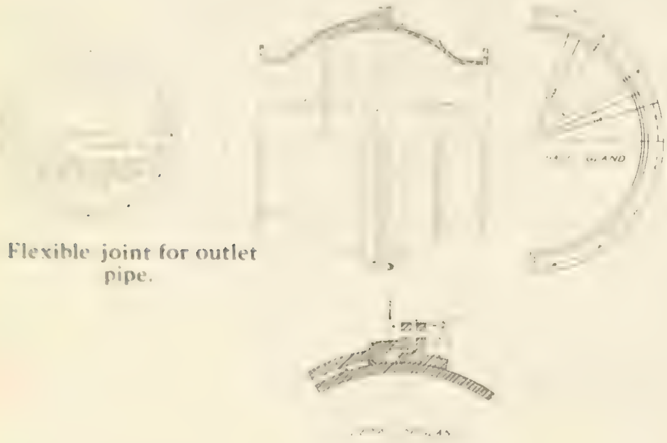
Under these circumstances, it might be well if clay-workers, in sending bricks to be tested for crushing strength, pointed out that the material used in cementing the two pieces of brick together, and to form a bedding or level surface above and below, should be as thin as it can be made, as thicker joints and beds give materially lower results.

West End Drainage Scheme, Ottawa

By L. McL. Hunter, City Engineer's Department, Ottawa

This scheme, which is at present under construction in Ottawa, was designed by Mr. Newton J. Ker, formerly City Engineer, and drains that part of the city west of Bayswater avenue to the city limits and north of Carling avenue to the Ottawa River. The total area which will be drained by the scheme amounts to 715 acres.

The population of the west end district in 1910 (the year in which the scheme was planned) was 2,900, but at the present time the population is nearing the five thousand mark. Ample provision was provided for an increased population. The total amount of sewerage to be treated per twenty-four hours is 160,000 gallons (1910 estimate).

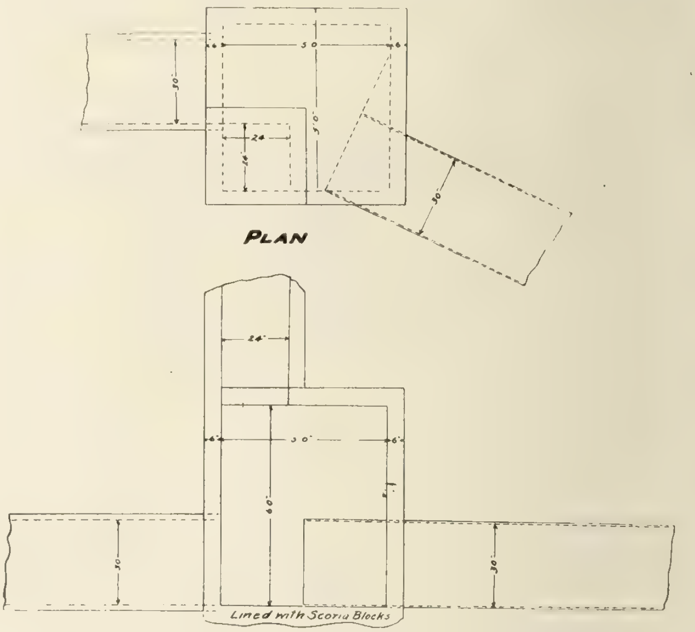

Flexible joint for outlet pipe.

Surveys for the scheme were commenced in 1907, but it was not until 1910 that the real work of designing the system was commenced. This was done by the Burkli-Ziegler formulae, combined system of sewers.

The sewers vary in size from six feet to two feet in diameter. In the system there are 3,200 lineal feet of 6-ft. reinforced concrete sewer; 1,850 lineal feet of 5-ft. sewer; 2,300 lineal feet of 45-inch sewer; 5,185 lineal feet of 36-inch sewer; 2,000 lineal feet of 30-inch sewer, and 1,100 lineal feet of 24-inch sewer. In the river part of the work there will be 370 lineal feet of 48-inch steel pipe and 200 lineal feet of 30-inch steel pipe. The depths to which the above sewers are laid vary from two to twenty-two feet.

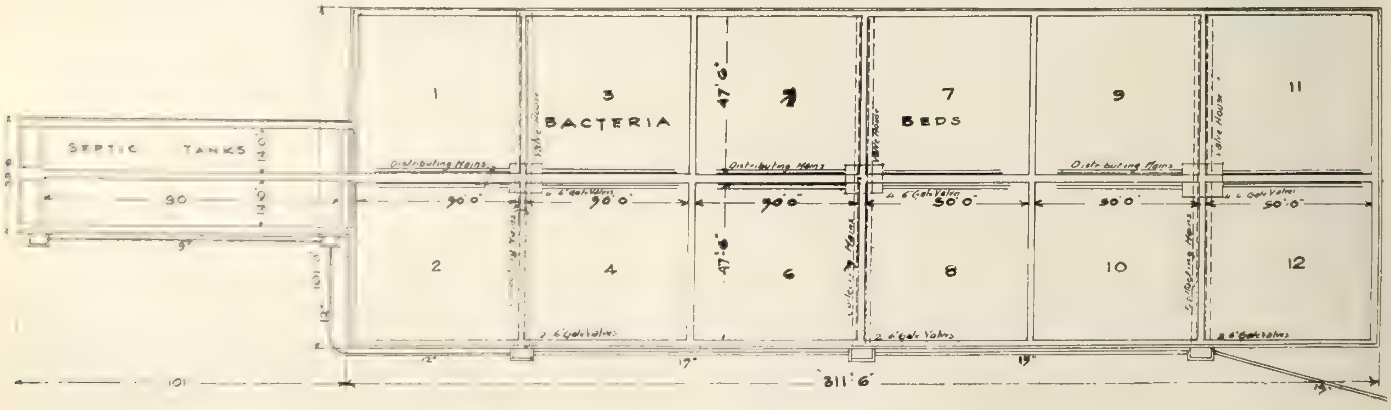
There are two septic tanks in connection with the purification of the west end sewerage. Each tank is 90 feet by 14 feet by 7 feet, inside measurement. The outside, or main, walls are 1 ft. 6 in. in thickness at the top and 2 ft. in thickness at the bottom. All the other walls are 9 inches in thickness. The top or cover of the tanks is constructed of reinforced concrete, 6 in. in thickness. The reinforcing is with steel rails weighing 56 lbs. to the yard, together with expanded metal, 3 inch mesh, No. 10. gauge. The reinforcing rails are placed at 4 feet 4 inch centres. The floors of the tanks are of 9-inch concrete and have a slope of 6 inches in 90 feet towards the outlet. Each septic tank has a 6-inch tile pipe "clean out" and is fitted with gas valves.

The grit chambers are built at the inlet of the tanks, each 13 ft. by 6 ft. 9 in. There is a 6-inch tile pipe "clean out" at the bottom of each chamber. Both are carried to a common manhole and are fitted with a 6-inch gate valve of the standard City of Ottawa type. The sewerage is led to the grit chambers through an 18-inch tile pipe from the 6-ft. concrete sewer, from which it flows through branches at right angles to an 8-inch pipe fitted with an 8-inch gate valve. Each grit chamber is fitted with one manhole.



Connecting chamber for 30" steel pipe. Plan and longitudinal section.

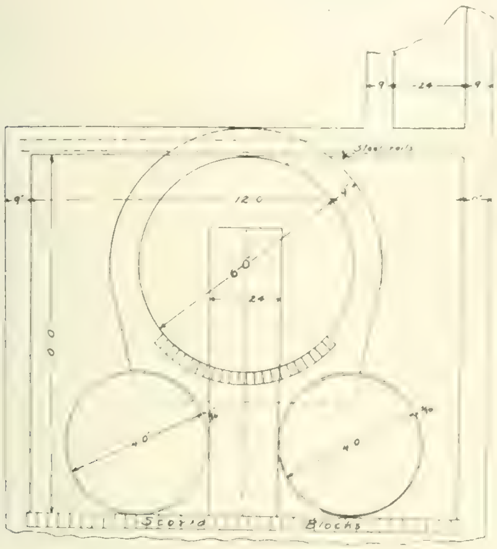
From the septic tank the bacteria bed effluent is to pass through 4-inch weeping tiles over an aerating weir. The weir is built practically level, so that the thickness of the stream of water passing over it shall be the same from end to end. After passing over the



General plan septic tanks and bacteria beds.

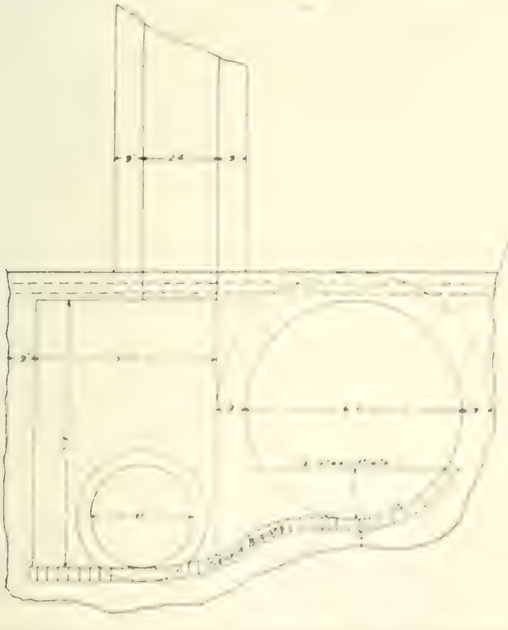
weir the effluent flows to the main channel of the bacteria beds.

There are twelve bacteria beds, constructed in pairs, each bed being approximately 50 feet square inside. They are constructed of concrete. The walls at the top are 18 inches in thickness and at the bottom 24 inches. The floors are of concrete, 6 inches in thickness. The cross-beams are of reinforced concrete, 6 in. x 9 in. and 9 in. x 12 in. The reinforcing is composed of steel rods, ¾ of an inch in diameter The posts supporting the beams are 24 x 24 inches, and 18 x 18 inches. The floors have a fall of 3 inches in 50 feet to the collecting channel.



Cross-section connecting chamber for 48″ steel outlets.

The effluent carrier runs along the east side of the bacteria beds and is of vitrified tile pipe, 15 inches in diameter. This runs as far as the collecting main to beds Nos. 1 and 2, and from there is reduced to 12 inches in diameter. The pipe connects to the clean out chamber of the septic tanks. The 15-inch effluent carrier is connected with the 6-ft. concrete sewer.



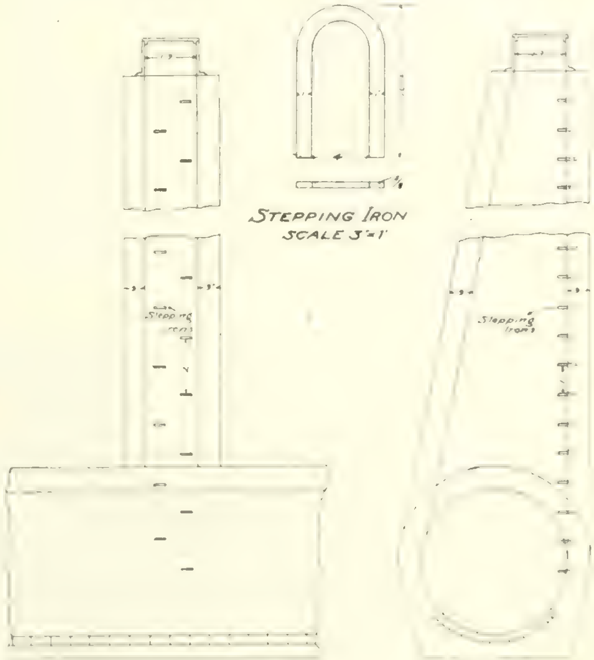
Cross-section connecting chamber for dry weather flow.

All the concrete used in the construction of the septic tanks and bacteria beds was composed of one part of cement to two parts of sand and four parts of broken stone (1:2:4). The exposed surface of all inside walls were coated ½-inch thick with Portland cement motor, the proportions being two parts cement to three of sand. All the internal angles of the walls and floors were finished to a 3-inch radius.

The total capacity of the tanks is 94,600 gallons. Allowing for the sewerage to stay in the tanks for six hours, the capacity would be 378,400 gallons per twenty-four hours.

The total capacity of the beds is 120,000 cubic yards. At the rate of 80 gallons of sewerage per cubic yard of filling this gives a capacity of 1,068,000 gallons per day.

The outfalls of the west-end drainage scheme will be situated a short distance above the Canadian Pacific Railway bridge, near Lemieux Island in the Ottawa River. Circular steel pipes of thirty and forty-eight inches diameter will be used, there being 200 lineal feet of 30-inch pipe and 370 lineal feet of 48-inch pipe. The flanges of the 30-inch pipe will be 3 inches by 3 inch by ½-inch angle iron, rivetted to each end of each pipe, ¾-inch bolt being used to secure the two pipes together. For the 48-inch pipes the flanges will be 4 inches by 4 inches by ¾-inch. A gasket of lead pipe, ½-inch and ¾-inch, for the 30-inch and 48-inch pipes respectively, securely wired with copper wire to one end of each pipe, will be used so that when the pipes are drawn securely together by the bolts, the joints will be water-tight.



Concrete manhole.

Quantities and Cost

The estimated quantities of excavation and materials under their different headings are as follows:—

Excavation (earth)	48,500 cu. yds.
Excavation (rock)	31,000 cu. yds.
Concrete in septic tanks	270 cu. yds.
Concrete in bacteria beds	1,384 cu. yds.
56 lb. rail in septic tanks	226 yards
Expanded metal in tanks	33,000 sq. ft.

The estimated cost of the scheme is for

Main drains and outfall works ...	$216,471.15
Subsidiary sewers	79,626.74
Total	[illegible]

Tenders were called for the work in April, 1911, and the contract was awarded to Mr. Thomas McLaughlin, of Ottawa. The construction work was commenced in June, 1911. So far, the only difficulty the contractor has met with was in July, 1911, when he struck an underground water course about fifteen feet below the surface, too large to be pumped. A coffer-dam was put in to hold the water back, but this subsequently leaked very badly and necessitated building another.

From the commencement of the scheme, Mr. McLaughlin has been using every labor-saving device possible, thus doing away with having large gangs of men labor being somewhat difficult to get during the summer months. Three derricks and two travellers were employed for hoisting the rock out of the trenches. The contractor was well equipped with steam drills, boilers, pumps, etc. Owing to a large percentage of sewers being constructed of concrete, and to the large amount of rock encountered, Mr. McLaughlin foresaw the great saving that would be effected by having his own stone crushed on the job and proceeded to set it to work, using the surplus material from the rock excavation for making the concrete.

The scheme should be completed about June of this year.

Grand Trunk Pacific Construction in 1913

With the recent announcement by Messrs. Foley, Welch & Stewart that the contract for the last section of the Grand Trunk Pacific Railway has been sub-let and in view of the fact that the first trains both east and west-bound have passed over the National Transcontinental Railway between Westfort and Cochrane, Ont., this new route from the Atlantic to the Pacific is now becoming a matter of practical politics with shippers and the final completion of this whole gigantic undertaking is well in view.

Whatever policy is adopted with regard to branch lines during the present year, it is generally understood that the first consideration by the company in its official programme of construction will be to complete the British Columbia section of its main line. The gap between the eastern and western heads of steel in that province is now only 426 miles and work on this portion of the line is actually under way throughout its entire length. Steel is laid to the Shuswap River, 1,123 miles west of Winnipeg, and 154 miles east of Prince George. A steel structure spanning this river will be placed in position as soon as footings (upon which work has been commenced) have been completed.

G. T. P. track-laying in the West.

East of Prince Rupert, the head of steel is now 195 miles from the Pacific Coast. Between that point and Aldermere several steel bridges have to be erected and some grading must be done. From Aldermere, easterly, the grade continues to the Endaka River, 341 miles from Prince Rupert, and there is then a gap of 126 miles of Prince George, upon which clearing work is being done.

Notwithstanding the heavy expenditure involved in the completion of the mountain section, the Grand Trunk Pacific will enter the towns of Brandon, Man., Moose Jaw, Sask., Weyburn, Sask., Battleford, Sask., and Calgary, Alta., this year and will push forward with all possible speed important extensions already undertaken.

This policy will mean the finishing of the Weyburn branch and Regina-Boundary line, the securing of terminals in Moose Jaw for the Regina-Moose Jaw branch (which is complete to a point just north of Moose Jaw) the ballasting of the Battleford branch, and the construction into Calgary of the line from Tofield.

On the line from Regina to the International Boundary, grading is finished as far as Frobisher, 136 miles from the capital of Saskatchewan, steel is laid for 106 miles to Hill Hall, and 90 per cent. grading is completed on the remaining portion between Frobisher and the American territory. The grade on the Tofield-Calgary branch has virtually reached Calgary. Track is laid as far as mile 176, and ballasting operations will soon be commenced along this line until Bow River is reached, when a halt will be called to allow of the erection of a steel structure at that point. When that is completed, track-laying will proceed to Elbow River, at which point another steel bridge will be put in place. Concrete piers are ready for the bridges in both cases. Terminals are now being prepared and the line should be in condition for the operation of passenger trains into Calgary by August 1st next.

The Alberta Coal Branch has been completed and work on another branch to the Yellowhead Coal Company's mine in now well under way. Work is also being done on a line to the Mountain Park mines, steel having been laid for 5 miles west of Edson, Alta.

Six new daily Grand Trunk Pacific trains to be run each way in Western Canada this summer are announced as follows:—Winnipeg-Fort William, starting June 1st; Regina-Moose Jaw, end of steel, starting August 1st; Calgary-Edmonton, starting August 1st; Harte-Brandon, starting August 1st; Regina-Boundary, starting August 1st; and Battleford-Oban, starting June 1st.

Eastward from Prince Rupert, trains are running on a regular schedule between that place and Hazelton, while steel has been laid as far as Porphyry Creek, nearly 20 miles farther, and grading is complete as far east as Aldermere. It is expected that steel will reach this last named point during the course of the summer. Grading has also been complete on a 14-mile strip from Fort Fraser to Prince George but the remaining 45 miles is untouched. At Burns Lake four steam shovels are moving the dirt as the grading is fairly heavy, while a fifth shovel has been moved from Telkwa to Fort Fraser. From the east end of Burns Lake towards Prince George, gangs are now working on the telephone line which is to connect up the various camps. To the west of the lake all contracts will be completed this spring with the exception of that between Fort Fraser and Prince George already referred to, which will require the whole summer for completion. About 100 four-horse teams are now engaged in hauling food to the camps so that supplies will be plentiful.

Work is being pushed as rapidly as possible on the bridge at Fraser River at Mile 142, B.C. As soon as it is completed the gangs will move to Prince George to build a second bridge across the Fraser at that point. The bridge at the Rau Shuswap, Mile 72, is practically completed. There is another small bridge at Mile 93, over the Fifty Mile River, but this will not take much time and the contractors are figuring on reaching Mile 100 in May. Between Mile 142 and this last-named point the only serious obstacle in the way of bridges is the crossing of the Fraser at Mile 188 but there is a splendid crossing there. The river banks are level, about 25 feet above the water, with fine approaches on both sides. There is one great barrier in the tunnel at Mile 132, which offers a hard problem in engineering and it is improbable that it will be completed this summer although a temporary track or "shoo-fly" will allow the steel to be carried past it down the river.

Arrangements have been made by the Grand Trunk Pacific Railway for the employment of 10,000 men this summer, their distribution on the various lines being as follows:—Work on main line between Tete Jaune and Hazelton, B.C., 7,000; completing Tofield branch into Calgary, 400 men; Regina branch line, 600 men; Moose Jaw, north-westerly branch line, 400 men; Biggar-Calgary line, 600 men; Cut Knife Branch from Calgary, westwards, 200 men; Harte-Brandon branch line, 250 men; work east of Winnipeg on the National Transcontinental Railway, 300 men. The work of these men will, it is calculated, bring to completion this year about 700 miles of main and branch lines.

Completed figures for 1912 show that, during that period, 969.90 miles of track were laid by the Grand Trunk Pacific and National Transcontinental Railways combined. The mileage is made up as follows:

Building the steel bridge over the McLeod River on the G.T.P.

Wolf Creek trestle, on the G.T.P.

Grand Trunk Pacific

	Miles
Main line (between Yellowhead Pass and Prince Rupert)	128.00
Regina towards International Boundary	136.00
Talmage to Weyburn, Sask.	0.25
Oban to Battleford, Sask.	48.50
Biggar towards Calgary	104.00
Battleford towards Wainwright	4.00
Tofield towards Calgary	92.00
Bickerdike towards Brazean	56.00
	608.75

National Transcontinental

At various points between:—	
Mileage 109 and 153, east of Quebec Bridge	33.00
Mileage 1 and 8.6, east of Quebec Bridge	7.50
Mileage 288 and 419, west of Quebec Bridge	84.75
Mileage 168, west of Cochrane and 192, east of Lake Superior Junction	235.90
	361.15

The telegraph service of the Grand Trunk Pacific announces the following programme of construction for the current year:—A line will be erected from Harte, Man., to Brandon, while the Regina-International Boundary line, the Regina-Moose Jaw branch line, the Young-Prince Albert branch line will be completed, as also a Battleford section through the Cut Knife district, an extension from Biggar, and the Tofield-Calgary line. The main line between Tete Jaune Cache and the Shuswap River, B.C., is being built and construction work is being done on the line between New Hazelton and the end of steel.

The Bonds of the Grand Trunk Pacific Saskatchewan Railway Company for terminals in certain cities have been guaranteed by the Saskatchewan Legislature for the following amounts:—Saskatoon, $1,200,000, Regina, $[illegible]0,000, Moose Jaw, $70,000, Prince Albert, $350,000; and Battleford, $100,000.

During the spring and coming summer, a large number of new towns will be placed on the map of Western Canada along the line of the Grand Trunk Pacific, information in regard to which can be obtained from the Land Commissioner of the company at Winnipeg. While many of these are still unnamed and by no means definitely located, over forty have been definitely decided on at present, and it is probable that all town sites on the company's existing lines will be located and named this year.

The new towns decided on are as follows:—

Main Line—Willow River, which is already on the market, Prince George, Smithers, and two other unnamed towns to be situated, the one at the confluence of the Chilako and Nechaco Rivers, and the other at the confluence of the Stuart and Nechaco Rivers. These are all in British Columbia.

Battleford and Cut Knife Branch—Prongua, 12 miles from Battleford; Gallivan, 25 miles; Normross, 33 miles.

Biggar-Calgary Branch—Springwater, 18 miles from Biggar; Ruthilda, 27 miles; Adino, 40 miles; Dodsland, 47 miles; Millerdale, 53 miles; Beaufield, 60 miles; Coleville, 67 miles; Driver, 73 miles; Smiley, 79 miles; Dowar Lake, 86 miles; Stratton, 91 miles; and Leverna, 104 miles.

Regina-Boundary Branch—Cedoux, 55 miles from Regina; Rainton, 62 miles; Brough, 73 miles; Innes, 85 miles; Huntoon, 91 miles; Viewfield, 97 miles; Hill Hall, 104 miles; Sander, 109 miles; Ninard, 115 miles; Breeze, 120 miles; Steelman, 126 miles; Deborah, 130 miles; Esperanto, 142 miles; Elcott, 151 miles; and Northgate, 156 miles.

Moose Jaw-Northwest Branch—Archydal, 10 miles from Moose Jaw; Forgray, 16 miles; Rowlett, 22 miles; Linstrom, 27 miles; Esbank, 33 miles; Darmody, 40 miles; and Mawer, 45 miles.

Regina-Moose Jaw Branch—Keystone, 18 miles from Regina; Stony Beach, 23 miles.

Talmage-Weyburn Branch—Mansur, 7 miles from Talmage.

The operation of trains by telephone despatching is now in force on all branch lines of the Grand Trunk Pacific west of Edmonton and will be extended to the whole system. On the Lake Superior branch the latest and most modern selective apparatus has been in use for some time past and will shortly replace that in use on the main line west of Edmonton.

More people are going into the interior of British Columbia from the various stations east of Tete Jaune and west of Hazelton than in any previous year, and a heavy summer business in all lines along the Grand Trunk Pacific is anticipated.

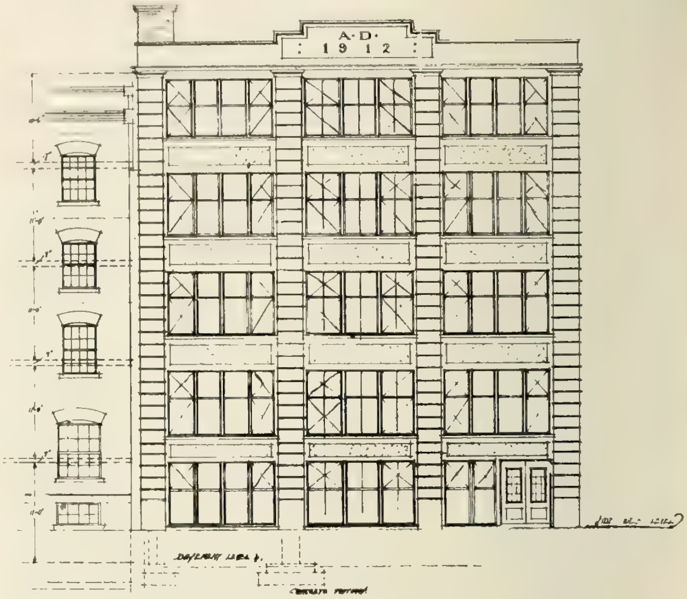
A run direct from Vancouver to Skidgate and thence to Masset is included in the spring schedule of the Grand Trunk Pacific steamship service this year. The freight business between the south and the islands is growing rapidly, which has necessitated this extension of service. Oil-fuel apparatus, similar to that already installed in the "Prince Rupert" and "Prince George," is being installed in the "Prince Albert."

Work on the "Fort Garry," the Grand Trunk Pacific Hotel at Winnipeg, is well advanced and construction has commenced on the "Macdonald" at Edmonton and on the "Qu'Appelle" at Regina. Other hotels are in prospect for Prince Rupert and Jasper Park at Miette Hot Springs.

In a recent discussion, Mr. Robert A. Cummings, of Pittsburgh, pointed out that the economy of concrete piles is based on their efficiency. This efficiency consists of: their permanence. Reduction in cost of footings and foundations, which do not have to be carried to subsoil water level, as in the case of wooden piles. The facility with which they can be made and driven as rapidly as wooden piles. Their adaptability to suit all kinds of foundation soils.

The New "Shareholder" Building, Montreal

An interesting example of a reinforced concrete structure designed on the Turner Mushroom system is illustrated in the "Shareholder" Building, Montreal. The principal advantage of this form of construction over other systems is due to the fact that an absolutely flat ceiling is obtained throughout without the use of beams and girders. This provides free and unobstructed illumination from the windows and allows for partitions to be placed anywhere without regard to the floor.



Shareholder Building, Montreal—Elevation to William St.

Unusual stiffness and solidity is obtained, due to the fact that a part of the material which in the beam type is placed in the rib, is consolidated in the slab, making the slab of unusual thickness with an actual decrease in the total amount of material where heavy loads are required.

The building stands on the site of a warehouse of mill construction that was destroyed by fire. Difficulties in the way of obtaining a good foundation necessitated the new factory being built on a concrete raft placed over the whole of the site. This is 18 inches thick and is placed on the top of the old cellar floor. The raft is reinforced in a manner similar to that of the upper floors, with ⅝-in. bars 30 ft. long at 11-in. centres. The mitoyen walls of the adjoining building

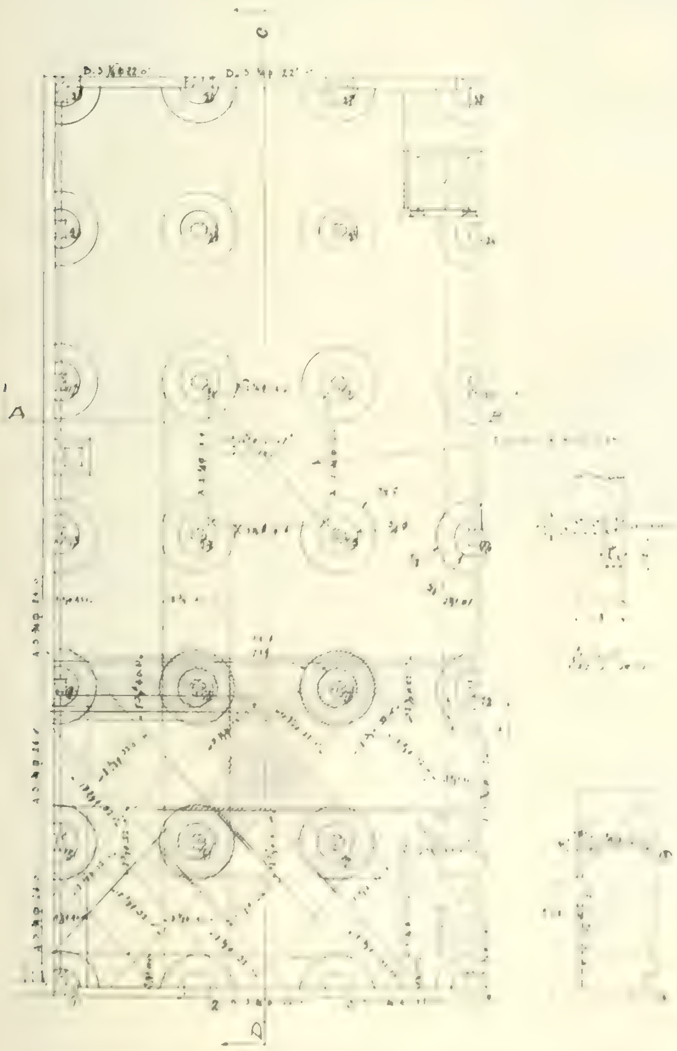
Shareholder Building—Interior view.

were found to be heavily loaded and to be resting on wood planks about 5 ft. long, set diagonally to the direction of the wall. To avoid disturbing the foundation of this wall by underpinning and cutting the planks, the side pilasters of the new building have their reinforcing bars carried into the thickness of the raft and into beams at each floor level against the floor. Consequently the new floors are carried directly by these pilasters and are not supported by the mitoyen walls at all.

The floors are designed to carry a live load of 200 pounds to the square foot and the building is constructed to carry an additional floor at a later date.

The outside wall is built entirely of concrete and has been finished with a tooled granite concrete face.

The floors are formed of hardwood throughout, except in the basement. A complete sprinkler system



Shareholder Building—basement floor ceiling. This plan is typical of upper floor.

has been installed. The supply to same has been taken from two separate sources, thus avoiding the use of an overhead tank. The flat ceilings (without beams) permit the spacing of sprinkler heads to cover the maximum amount of area possible and reduce the cost of equipment.

Cast iron spool sockets to take ⅝-in. screw bolts have been laid in with the concrete, finishing flush with the ceiling on each floor at about 36-in. centres. In this way the machinery can be fixed without cutting the concrete in any way.

The contractors for the building were the Atlas Construction Company of Montreal, and a good deal of credit is due to them for the expeditious way in which the building has been erected, the same having been completed under five months from commencement. It is interesting also to note that the cost of the building complete with heating has worked out at low cost of 14 cents a cubic foot. Mr. Morssen, C.E., of the Atlas Construction Company, acted as consulting engineer in the preparation of the details of the reinforced concrete, the building being designed and carried out under the supervision of Mr. Philip J. Turner, F.R.I.B.A., Board of Trade Building, Montreal. The factory is now being installed with the most up-to-date machinery for the "Shareholder" Company, and when finished will be one of the best and most complete printing establishments on the continent.

IN connection with the sewer construction at West
cess. During the winter of 1911 and 1912 the
frozen ground was used with considerable suc-
Liberty, Iowa, a novel method of dealing with
ground was frozen to a depth of about 4 ft., and in this state resisted all efforts of the trenching machine to break it. Finally, lime was placed, covering the width of trench to be opened, and was broken up into small pieces and covered with straw, hay or manure. Water poured upon it so as to slake the lime thoroughly. The covering retained the heat, which with the hot water penetrated the frozen ground sufficiently to enable the trenching machine to make headway. On another job a covering of old boards with a steam jet was found to get over the difficulty.

Portions of a wire rope, 7,810 feet in length and
ore each down an incline 5,800 feet long, were
for lowering trucks containing about 45 tons of
weighing 56 tons, that has been used in Cuba
recently tested at Lehigh University. The object of the tests was to determine the loss of strength due to actual use extending over eighteen months. Therefore pieces cut from the cable and other pieces that had not been used were tested to destruction, the test specimens being 20 ft. long in each case. It was found that the new cable broke under the tensile load of 325 tons, while the worn cable withstood a load of nearly 270 tons. This rope consists of six strands of nineteen wires, each twisted around a hemp core, with six outer strands of nineteen wires, and is said to be the most powerful wire rope hitherto made.

ELECTRIC cables for the control, power and
will be carried in vitrified clay ducts, which
have already been placed in Gatun and Pedro
lighting systems of the Panama Canal locks
Miguel locks and are being placed at Miraflores. For the control and power systems 246 miles of lead-covered cable are to be pulled through these ducts, in addition to which there are 112 miles of wire of miscellaneous sizes. On account of the large amount of cable to be handled the expedient of laying it from an electrically driven winch has been adopted. Before the operation is begun the ducts are carefully cleaned. Then a lead wire is pulled through, and by this means a manila cable is drawn through the duct. The electric cable is attached to the rope, and the winch is set in motion. By this method it is possible to pull 900 ft. lengths of No. 0000 B. and S. gauge lead covered cable at one time, where the average length by other methods is about 300 ft.

Reinforced Concrete in Theatres

Interesting Examples from Both European and American Practice Which Indicate Even Greater Possibilities in This Field

By V. J. Elmont, Montreal.

THE outstanding requirements of a building material to be used in the erection of theatres are fireproofness and proper acoustic qualities, and these requirements are best fulfilled by reinforced concrete. As an example of the importance laid upon the question of fireproofing of theatres and the care with which reinforced concrete is studied, it may be mentioned that the Austrian Government, in connection with the Austrian Society of Civil Engineers, has built a model theatre in Vienna, with all floors, walls, columns, roof, etc., of reinforced concrete, in order to give experts interested in theatre building an opportunity to observe fire-tests and study the best layout for such construction. The model theatre has a stage 25 ft. broad and 20 ft. long, the auditorium being 19 x 23 ft. The many fire tests that have been made in this theatre have proved conclusively how well adapted reinforced concrete is for rendering theatres fireproof.

Mr. V. J. Elmont*

The number of theatres built either wholly or with a skeleton of reinforced concrete has enormously increased in recent years. Between these two extremes are to be found many examples of mixed systems, where one part of the building is entirely in reinforced concrete and the other in brick or cut stone. The little theatre shown in Fig. 1 has the walls built strong enough to carry and stiffen the whole building, and the reinforced concrete is only used for the floors and cantilevers supporting the auditorium rows. The theatre has 750 seats in all, distributed over the parquet with 340, and 150 and 260 in the balcony and gallery. The maximum outhang of the cantilevers is 14 ft. Fig. 2a and 2b give a cross-section and plan of the balcony respectively.

The town theatre in Basel (Fig. 3) has been built almost entirely in reinforced concrete. Thus the parquet floor, the stores underneath it, the four upper circles, the ceiling over the pit and the roof are constructed in this material. By this the architect's requirement that the interior construction and the roof should be perfectly fireproof was fulfilled.

The exterior walls are of cut stone, the interior of brick, while those around the auditorium are of reinforced concrete, forming a connected whole, with the cantilevers for the very projecting circles and the floors over the foyers and refreshment rooms. The parquet floor, which slopes toward the stage (Fig. 3), supported by columns and beams, is provided with numerous openings for the conduction of hot air.

In the construction of the upper circle the chief restriction was that no columns were allowed, in order to ensure a free view of the stage; for this reason all the four circles were built as cantilevers (Fig. 4); the first circle has 16 ft. overhang (Fig. 5), second 10 ft., third 9 ft., and fourth 16 ft. (Fig. 6). The two lower circles are fixed in the wall between the stage and the foyers and are stiffened by radial beams. Each of the two upper galleries, together with its own corridor, is built in one monolithic mass as shown in Fig. 6. The steps on the circles are built of 2" thick concrete slabs resting on 4" thick concrete supports at the cantilever beams, the horizontal space between the seating slabs allowing the circulation of hot air.

The flat ceiling (Fig. 4) over the pit is suspended from the arch roof in the plane of the tie rods of the same, thereby protecting the tie rods from fire. Forming part of the decoration of the ceiling and suitably masked, there is an annular ring of three angular cross-section (Figs. 3 and 4), open on the lower side to the foul air rising from the building. Between the arch roof and the ceiling, fans are placed for sucking the foul air through this ring and conveying it outside the building. The arch roof has a span of 110 ft. with 33 ft. raise, it is 10 in. thick at the crown and 20 in. at the springing line. The roof proper is a light wood construction supported by the reinforced concrete arch and covered with entenith slate.

The new theatre in Copenhagen shows also a mixed use of reinforced concrete and brick. Round all the stair shafts, the cloak rooms and the stage are thick brick walls (see Fig. 7, plan of parquet), while the auditorium and the corridors are surrounded by concrete columns and beams, supporting curtain walls. All the floors and stairs are of reinforced concrete. The entrance street runs through the theatre under the

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*Mr. **Valdemar J. Elmont** was born at Copenhagen, Denmark, in 1880. He obtained the degree of C. E. from the University of Copenhagen, graduating with first-class honors and obtaining the University prize awarded to the first student of his year. His first professional appointment was as assistant engineer in the Public Works Department of the Danish Government. Later, he spent two years in Germany with the Lolat Reinforced Concrete Construction Company, first as designing engineer and then as chief engineer at Dusseldorf. From 1906 to 1912 he was chief engineer for Messrs. Christiani & Nielson, Copenhagen, engineers and contractors for reinforced concrete structures. With this firm he had extended experience in all classes of structural work and travelled extensively in Europe. Mr. Elmont came to Canada in 1912 and has been engaged upon reinforced concrete construction of various kinds for the C. P. R. He is the author of an interesting paper, "Trusses Without Diagonals in Reinforced Concrete," published in the Contract Record of April 2, 1913.

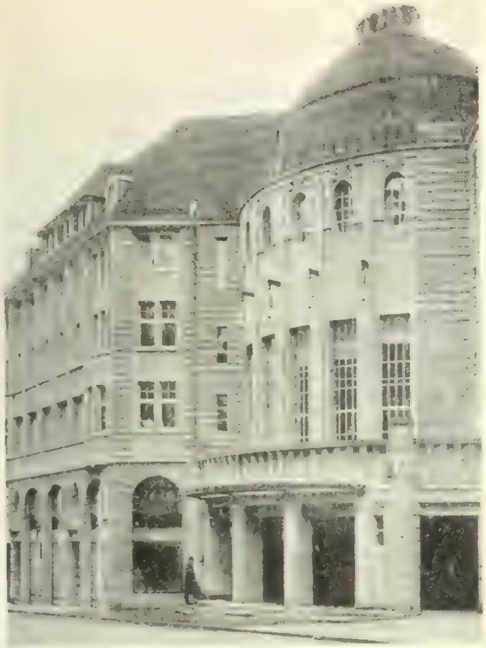

Fig. 1

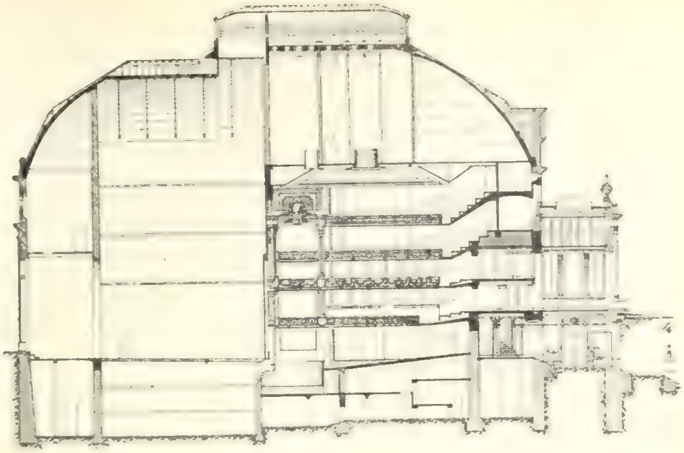

Fig. 3

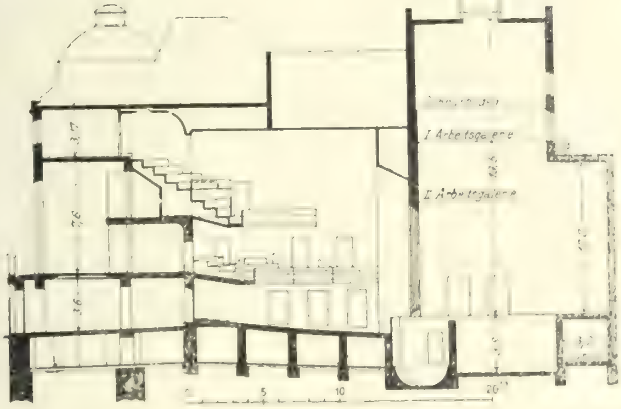

Fig. 2a

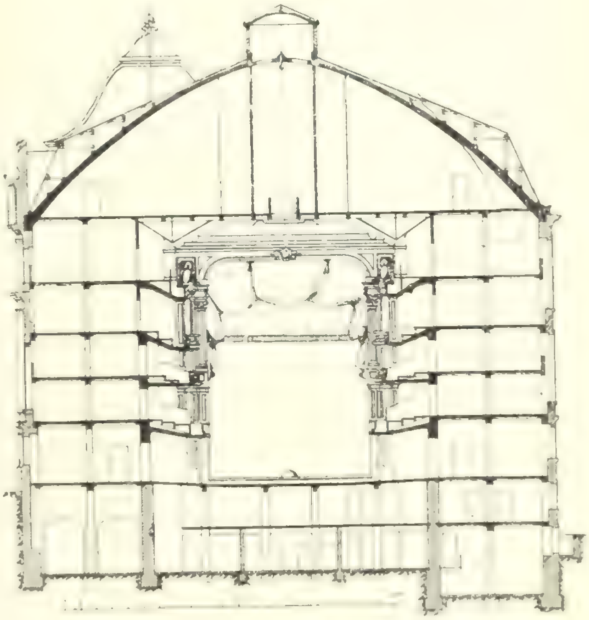

Fig. 4

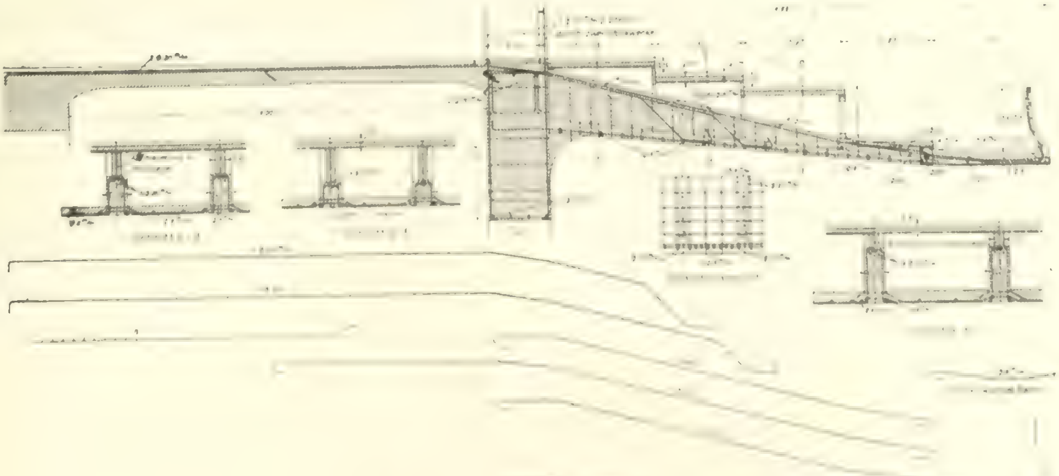

Fig. 5

Reinforced Concrete in Theatres.

parquet. From this one arrives into a semi-circular hall, containing some of the cloakrooms and the ticket offices. A broad and monumental staircase leads from here up to the foyer around the parquet and the cloakrooms for these seats. Besides this staircase two others are arranged to the upper circles.

Through the hollow space between the ceiling over the street and the parquet floor (see Figs. 8 and 9 showing respectively the longitudinal and cross-section of the theatre), the heated fresh air is blown into the auditorium at the rate of 35 cubic yards per hour per chair. For the upper circles the warm air is conducted through channels in the walls, cavities in the circle construction, and out under the seats. The foul air is here sucked out through holes in the ceiling.

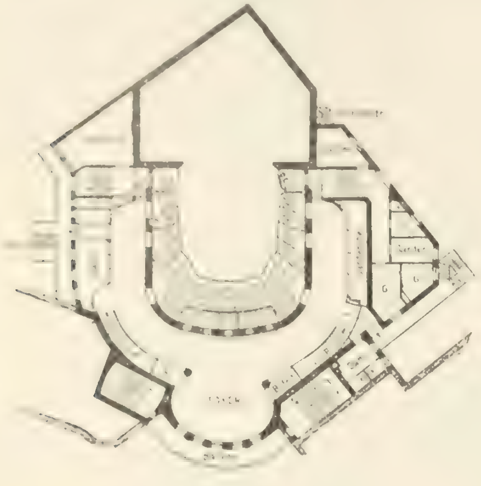

Fig. 2b.

The cantilevers for the circles, which in this theatre reach a free span of 19 ft., are formed in two different ways. At the sides of the auditorium the beams forming the ceiling over the foyers are cantilevered over (Fig. 9) to form the consoles—the pivot of the cantilevers being the T beams, which run over the heavy columns built in the auditorium walls and which also support the curtain walls.

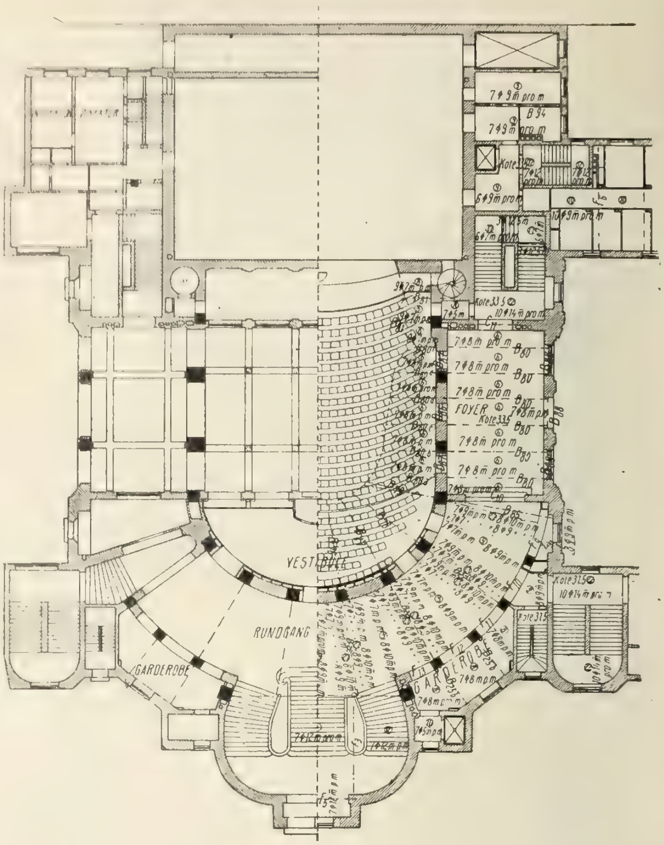

Fig. 7.

Opposite the stage and where the greatest overhang is situated, the cantilevers are fixed only in the strong reinforced concrete columns around the auditorium (Fig. 8), so that these columns will take both

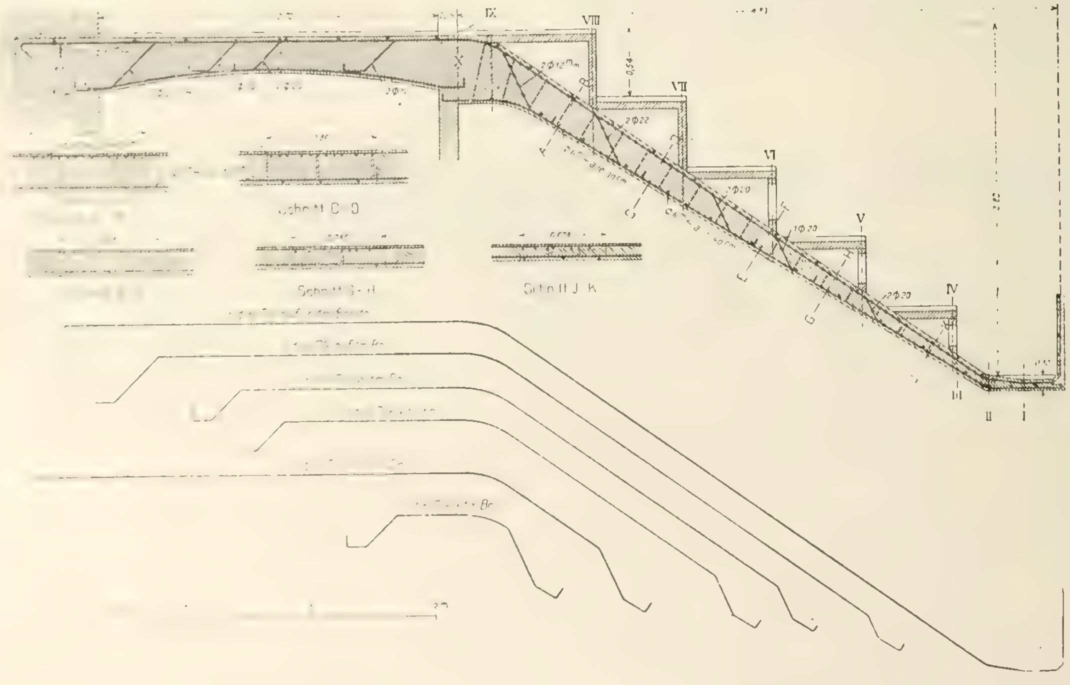

Fig. 6.

compression and bending. The ceiling is carried by four Vierendeel trusses, i.e., trusses without diagonals, only with verticals constructed in a special manner suitable to the properties of reinforced concrete, and one common truss (with diagonals and verticals) nearest to the stage, built also entirely in concrete (Figs. 8 and 9). Over these five trusses the arch roof is placed. It has a 50 ft. span and is 4 in. thick at the crown and 10 in. at the springing line.

A theatre entirely in reinforced concrete has, according to the "Engineering News," been built in Los Angeles, Cal. It is a two-balcony theatre, in front of and over which is an eight-storey and basement office building, all built of reinforced concrete. In general design it follows the usual column, beam and floor standards, but in the cantilever, balconies and roof beams over the auditorium, the extraordinary size of the members make them worthy of record.

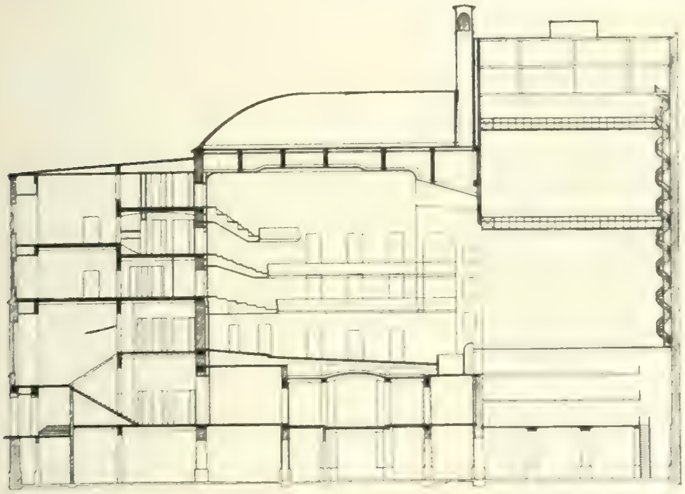

Fig. 8.

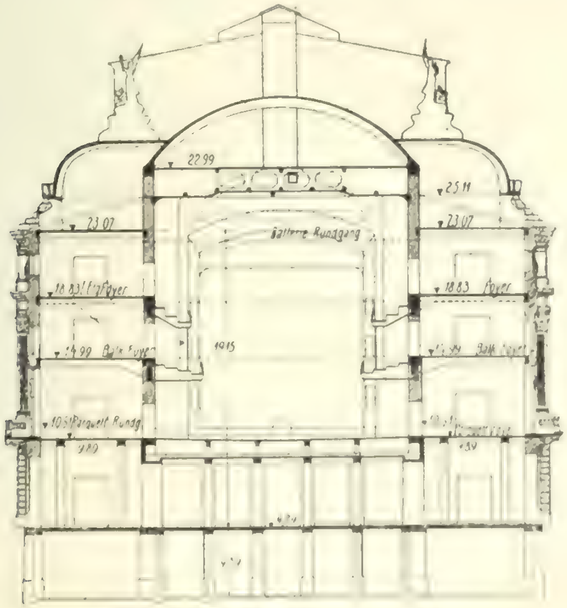

Fig. 9

The walls are for the larger part of concrete, covered on the outside with tile to the first storey and with brick above. Inside the concrete faces are covered with plaster, decorated in accordance with the style of the building. As it will be seen by this plan (Fig. 10) the stage proper occupies the full width of the lot, 79 feet, but to comply with the building regulations, a 6 ft. alleyway is provided on either side of the auditorium and office building leading from the street to the stage, so that the front of the building is only 67 feet in width. Into this alley fireproof exits lead by way of concrete staircases.

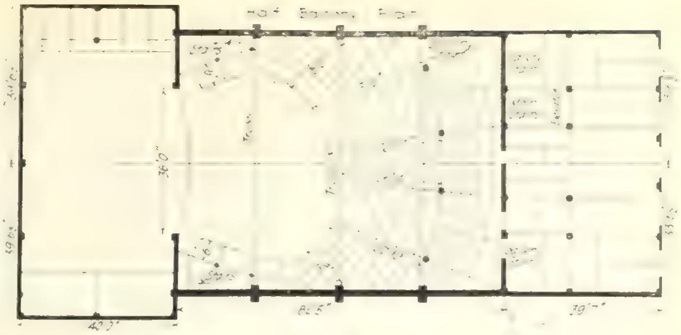

Fig. 10.

The longest cantilevers of the gallery and balcony are 27 ft. and 30 ft. projection respectively, and the balcony is supported by six of these cantilevers, giving it a free archway of 30 ft. The two side cantilevers are brackets 18 ft. long, coming off of the truss columns on either side of the auditorium. The four great central cantilevers are supported on independent columns, which are located in the curtain wall between the main floor of the auditorium and the foyer. The cantilevers rest on these columns, extend back over the foyer and are anchored in the reinforced concrete wall six storeys high at the rear of the auditorium (Figs. 11 and 12).

That portion of the balcony between the cantilever is constructed similar to the ordinary joist system. The risers are reinforced concrete joists, or beams, resting on the cantilevers and monolithic with them, while the slab is supported on the top of one riser and hung from the bottom of the next. This construction is very economical in reinforced concrete, for, unlike with other material, these beams are cast to conform to the curve of the balcony seats, a feature that could not be carried out in structural steel except at a considerable increase in cost.

Both the balcony and the gallery were designed to sustain a superimposed load of 125 lbs. per sq. ft. and have been tested to over double that load. In making these tests the cantilever arm, only, was loaded, no load being placed on the anchor arm. This, of course, was the worst possible condition and made the tests extremely severe ones; under the load the

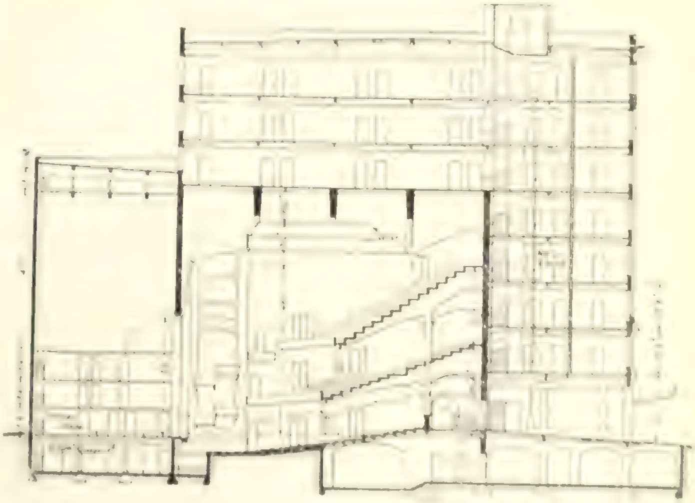

Fig. 11.

deflection at the end of the 30 ft. cantilever was only ¾-in. On the gallery a load over 270 lbs. per sq. ft. was placed directly over one cantilever, extending from centre to centre of adjoining panels and from the column supports to the front rail of the gallery. The deflection at the end of the 26 ft. long cantilever was 3 16-in. An allowance of 150 lbs. for the average weight per person of an audience and 50 lbs. for the weight of the opera chair and accessories, gives a total of 200 lbs. The space allowed to an opera chair is 3.75 sq. ft. exclusive of aisles. This gives a maximum possible load of 50 lbs. per sq. ft. with every chair filled.

On either side of the proscenium arch, which is also of reinforced concrete, are the boxes in two tiers, and no boxes are on the same level, being so arranged that the top of the rail of the farther box is on a level with the head of the occupants of the box nearer the stage. These boxes project from the wall 6 ft. and are carried by a 6-in. cantilever slab. The complicated structure around the boxes, consisting not only of the boxes and rails at different levels, but also of partition walls, several flights of stairs and the main walls of the building, were all cast at the same time,—truly a monolithic structure.

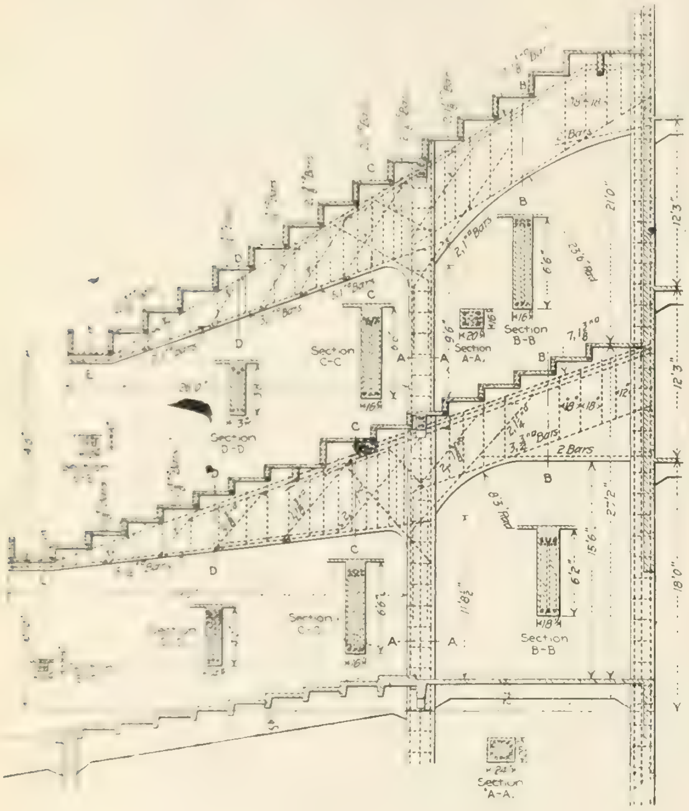

Fig. 12.

The roof beams over the auditorium carry a three-storey building on them. They have horizontal chords and are 71 ft. long over all, 10 ft. deep, 24 in. wide at the top, 18 in. at the bottom and calculated to support a live and dead load of 570,000 lbs.

The above examples of theatres in reinforced concrete are only few among the many which have been built in the 20th century, and doubtless its employment for this purpose will advance more and more with the succeeding years as the subject now receives its proper attention at the international congresses of architects.

At the congress in London, 1906, where it was discussed for the first time, a very great future was prophesied for the use of this material in architectural work. At the later congresses in Vienna and Rome great attention was paid to reinforced concrete. One of the results of these discussions is, it may be fairly assumed that in Europe (at all events) not a theatre, church, school, hospital, post office, greater railway station or other public building is erected in which the proper reinforced concrete is not used to a large extent.

Tensile Tests of Concrete

A series of tests on concrete specimens measuring 18 inches long by 6 inches square has recently been made in the engineering laboratory at Cornell University.

The specimens were of three different mixtures, the first a 1:2:4 mixture containing limestone crushed to pass a 1½-in. ring, the second a 1:2:4 mixture containing sandstone, crushed to pass a 2½-in. ring, and the third a 1:2½:5 mixture containing crushed sandstone similar to that of the second mixture. In six tests the 1:2:4 limestone concrete showed an average tensile strength of 278 lb. per square inch, the highest being 308 lb. per square inch, and the lowest 253 lb. per square inch. In nine tests, the 1:2:4 sandstone concrete showed an average tensile strength of 150 lb. per square inch, the highest being 178 lb. per square inch, and the lowest 128 lb. per square inch. In nine tests, the 1:2½:5 sandstone concrete showed an average tensile strength of 129 lb. per square inch, the highest being 179 lb. per square inch, and the lowest being 97 lb. per square inch.

It is worthy of note that in many instances particles of sandstone were split in two in the plane of the fracture instead of breaking the bond with the mortar; this was particularly so in the case of the red sandstone, and illustrates the importance attaching to the skeleton of aggregates for employment in concrete work.

The Rock Island filters showed in 1912 an average colony count in the effluent of 67 bacteria per cubic centimeter, with 10 per cent. of the samples showing gas formers. In the raw water, according to Mr. R. W. Sharp, superintendent of the waterworks department, in a paper presented to the Illinois Water Supply Asociation, there was an average of 7,660 bacteria per cubic centimeter, with 82 per cent. of the samples producing gas. The average color was reduced from 75 to 15 parts per million. During the year aluminum sulphate and bleach were not used in parallel at all times, but were alternated in order to check different modes of operating the plant with the various changes in the raw water. As considerable difficulty was experienced with the original 350 ft. of coagulent feed piping, Mr. Sharp states that fiber pipe and rubber hose were installed in July 1912, and up to date have given much better results.

In the course of an address delivered by Mr. Frederick Tench, of New York, the design, erection, and employment of derricks in structural work were discussed at some length. It was pointed out that accidents in connection with this class of appliance are due not only to the use of imperfect derricks, but also to the improper use of good derricks. Inadequate guying, insufficient anchorage of the stifflegs, sudden strains occasioned by slipping loads, and neglect of lubrication are things to be carefully avoided.

The Construction and Finishing of Floor Slabs

By C. A. P. Turner, Minneapolis

CONSTRUCTION work of any kind involves a grave responsibility, not only on the part of the designer, but also on the part of those in charge of the work, and that is responsibility for the safety of those erecting the work.

Perhaps no type of building is so free from hazard and risk to the lives of those putting it up as reinforced concrete construction when scientifically and intelligently executed. During the last ten or twelve years, through improvements in methods of manufacture and great reduction in cost, the manufacturers of Portland cement have placed this material on the market at such reasonable rates that it has given a great impetus to the construction of concrete work in all lines. Since as a material of construction it has but recently come into general use, it is not surprising that a large part of the engineering and architectural profession have not yet become so familiar with its characteristics, but that designs lacking in conservatism from a scientific standpoint, have been frequently made, and those combined with the execution of the work by unskilled contractors, has resulted in a number of instances in needless sacrifice of life and large property losses. A more thorough knowledge and study of the characteristics of the material should entirely prevent these.

Mr C. A. P. Turner.*

It is the intent of this short discussion to call attention pointedly to those properties and characteristics of concrete which must be known and appreciated by the engineer and constructor in order that he may avoid the serious disasters into which those ignorant or forgetful of them have been so frequently led.

Concrete may be defined as an artificial conglomerate stone in which the coarse aggregate or spacer filler is held together by the cement matrix. The cement should conform to the Standard Specifications for Cement, recommended by the American Society of Testing Materials.

The contractor and architect should, at least, see that the cement is finely ground and that it meets the requirements of the boiling test. This last may be readily made by forming a pat 3 1-3 to 4 in. in diameter on a piece of glass, kneading the cement thoroughly with just enough moisture to make it plastic, so that the pat will hold its shape without flowing, and tapering to a thin edge. Store the pat under a moist cloth at a temperature of sixty-five to seventy-five degrees for a period of 24 hours. Then place the pats in a kettle or pan of cold water and, after raising the temperature of the water to the boiling point, continue boiling for a period of four hours. If the pats do not show cracks then, and if they harden without cracking or disintegrating, the constructor may be satisfied that the cement is suitable for use in the work. Coarse grinding reduces the sand-carrying capacity of the cement, and its consequent efficiency.

The function of the concrete element in the combination of reinforced concrete is to resist compressive stresses in bending. When first mixed the concrete is nothing else than mud, and in order for it to become the hard, rigid material necessary to fulfil its functions in the finished work it must evidently pass in the process of hardening through all stages and varying degrees of hardness—from mud and partly cured cement to the final stage of hard, rigid material. This curing, or hardening, being a chemical process, it does not occur in any fixed period unless the temperature conditions are absolutely constant. Hence the time at which forms may be safely removed is not to be reckoned by a given number of days but rather it must be determined by the degree of hardness attained by the cement. In other words, during the warm summer weather, concrete may become reasonably well cured in twelve or fifteen days. If, however, the weather is rainy and chilly, it may not become cured in a month. In the cold, frosty weather of the spring and autumn, unless warm water is used in the mix, the concrete may require two or three months to become thoroughly cured, while by heating the mixing water whenever the temperature is below 50 degrees Fahr., the concrete will harden approximately as it does during the more favorable season. Concrete which has been chilled by the use of ice-cold water, or that has become chilled within the first day or two of the time it is cast, has this peculiarity that it is very difficult indeed for the most expert to determine when it is in such condition that it will retain its shape after the removal of the forms. Once having been chilled in the early stages, it goes through consecutive stages of sweating with temperature changes, and during these periods it sometimes happens that the concrete diminishes in compressive strength, and if the props are removed it sags and gets out of shape. Such deformation will generally result in checks and fine cracks, though there may not be any serious diminution of the ultimate strength. These checks may be avoided as outlined above by the simple method of heating the mixing water whenever the temperature has dropped below 50 degrees Fahr. In colder weather, that is, below the freezing point, not only must the water be heated, but as a rule the sand and stone, too, also a little salt may be advantageously used. The work must then be properly housed and kept warm for at least three weeks subsequent to pouring.

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*Mr. C. A. P. Turner, the originator of the famous Mushroom system, was educated at Lehigh University. Upon graduating, he worked as a draughtsman at the Edgemore Bridge Works, then as assistant engineer at the Columbus Bridge Works, Columbus, Ohio, and later as special designing engineer at the Pittsburgh Bridge Works. After obtaining much more valuable experience, he engaged in business for himself in 1901, shortly afterwards making a specialty of concrete construction. He designed the first reinforced concrete skeleton buildings in Minneapolis, Duluth, Winnipeg, Brandon and other cities. He has successfully designed between one and two thousand concrete structures without a single failure, as a result of which the Mushroom system has become a synonym for safety. In the line of greater engineering work, Mr. Turner has been engaged for a number of years as consulting bridge engineer for the Soo line. He has designed a large amount of bridge work, including the great viaduct over the St. Croix River, which is about 180 feet from the roadway to the river and consists of five 350-ft. arch spans of novel design, with trestle approaches. He is the inventor and designer of the well-known transporter bridge across the ship canal at Duluth. Last year he was awarded the competition for the Georgia-Harris viaduct in Vancouver, costing half a million dollars. Mr. Turner has Canadian offices at Winnipeg, Vancouver and Calgary, and he is represented in Montreal by Mr. C. M. Morssen, consulting engineer.

Use of Salt in Cold Weather

I have referred to the use of salt in cold weather. The action of salt is twofold: it retards the setting and thus enables us to use water heated to a higher temperature than we could otherwise, and, secondly, it reduces the freezing point. Then should the concrete be frozen, at the subsequent sweating period which occurs with a rise in temperature, the salt retains the necessary moisture for crystallization because of its affinity for moisture, thus preventing the softened concrete from drying out and disintegrating through lack of moisture to properly crystallize and harden. The amount of salt to be used is about a cup to the sack of cement with the temperature from 18 to 20 degrees Fahr. If the temperature is below this, increase the amount of salt and when working below zero Fahr., use not less than two cups of salt to the bag of cement.

Pouring Concrete

Bad work frequently results from improper pouring, or casting of the work. In filling the forms, the lowest portion of the form should be filled first. A column should be filled from the centre and not from the side of the cap. Filling from the centre will insure a clean, smooth face when the forms are removed. Filling from the side will frequently give a bad surface, since the mortar will flow into the centre of the column through the hooping, leaving the coarse aggregate with voids unfilled at the outside. Then, as more concrete is poured in, the voids between the core and the outside portion will become filled and the soft mortar will not be able to flow back to fill the voids fully between the hooping and the casing unless this method of casting is observed. Where the spacing of the hooping is wide, this is not so important, but it becomes very important where close spacing of the spiral is used. It is better to cast the column and Mushroom frame complete, continuing to pour the concrete over the centre of the column so that it always flows from the column into the Mushroom slab rather than the reverse. All splices must be made in a vertical plane, preferably in the middle of a beam and in the centre of the slab, in a vertical position.

Test for Hardness—Warm Weather

I have pointed out that the criterion governing the safe removal of forms is the hardness or rigidity of the concrete. A test of hardness in concrete not frozen is driving an eight-penny common nail into it. The nail should double up without penetrating more than half an inch. The concrete should further be hard enough to break like stone in knocking off a piece with the hammer. Noting the indentation under a blow with the hammer gives a fair idea of its condition.

Sub-centreing as provided in the appended specification is a desirable method of preventing deformation where the use of the centreing is desired for upper storeys and the concrete is not fully cured.

Test for Hardness—Cold Weather

Concrete freshly mixed and frozen hard will sustain itself nicely and carry a large load in addition, until it thaws out and softens, when collapse in whole or part is inevitable. Partly cured concrete frozen sweats and softens with a rise in temperature, hence in cold weather there is danger of mistaking partly cured concrete, made rigid by frost, for thoroughly cured material. In fact the only test that can be depended upon with certainty in cold, frosty weather, is to dig out a piece of concrete, place a sample on a stove or hot radiator, and, as the frost is thawed out, note whether it sweats and softens. This will give the builder and engineer a clean-cut idea as to the condition of the work,—whether it is cured or merely stiffened up by frost.

Lap of Reinforcement Over Supports

Thoroughly tieing the work together by ample lap in the reinforcement is a prime requisite for the safe construction of any form or type. This general precaution insures toughness and prevents instantaneous collapse, should the workmen exercise bad judgment in premature removal of the forms.

Responsibility of the Engineer

The extent to which it is possible for the engineer to go in securing safe construction is limited in the first place to the production of a conservative design and one which will present toughness, so that its failure under over-load or under premature removal of the forms will be slow and gradual. This he can do, and this, I believe, he is morally bound to do. On the other hand, he cannot design reinforced concrete work which will hold its shape without permanent deformation unless it is properly supported until the concrete has had time under proper conditions to become thoroughly cured.

Concrete in setting shrinks and sometimes cracks by reason of this shrinkage, particularly when it hardens rapidly, as it does in hot weather. This shrinkage sets up certain stresses in the concrete which, combined with temperature changes, occasionally manifest themselves by subsequent cracks in the work. Such checks or cracks do not of necessity indicate weakness, providing the concrete is hard and rigid, since the steel is intended to take the tensile stresses and the concrete the compressive. Such checks sometimes cause an unwarranted lack of confidence in the safety and stability of the work, arising from the common lack of familiarity with the characteristics of the material. For example, the owner of a frame building would never imagine it to be unsafe because he found a few season checks in the timber. He is sufficiently familiar with the seasoning of timber to understand how these checks occur, and that in most instances they do not mean a loss of strength, since, as the timber hardens by thoroughly drying out, it becomes stronger as a rule to an amount in excess of any slight weakness which might be developed by ordinary season cracks or checks. So in concrete. When the general public becomes more familiar with its characteristics they will regard as far less important than they now do, checks which are produced by temperature and shrinkage stresses, or possibly by slight unequal settlement of supports.

A Large Reinforced Concrete Factory at Berlin, Ontario

By H. F. H. Hertzberg.*

THERE is now being built by the Dominion Tire Company in Berlin, Ont., a reinforced concrete factory and warehouse which, when completed, will be one of the largest buildings of this class in Canada.

Some 800 tons of reinforcing steel, comprising Kahn Trussed and Rib Bars, Column Hooping, Metal Floretyle, and Hyrib, and also approximately 40,000 square feet of steel sash, will be used in the structure. It is this portion of the construction—the reinforced concrete skeleton—that it is the purpose of this article to describe in a general way, with reference, in detail, perhaps, to those few points which may present features of interest from the standpoint of their design.

The building will be 432 ft. long by 90 ft. wide, with four storeys and basement. The columns and footings are designed to carry an additional storey to be added at some future date and future extensions at either end of the building are also provided for. The skeleton type of construction is being used with exterior columns and beams of reinforced concrete supporting 12-in. brick curtain walls and the steel sash. The bottom of the exterior wall beams is flush with the bottom of the slab they carry, thus permitting the steel sash to extend to the ceiling line and thereby obtaining the maximum amount of light.

The floors are designed to carry the following superimposed loads:—ground floor, 300 lbs. per sq. ft. of surface; second floor, 300 lbs. per sq. ft. of surface; third floor, 300 lbs. per sq. ft. of surface; fourth floor, 250 lbs. per sq. ft. of surface; fifth floor (present roof) 200 lbs. per sq. ft. of surface.

A cross section of the building shows four panels, each 22 ft. 6 in. long, with five longitudinal rows of columns. For a distance of 131 ft. from the north end of the building these panels are 21 ft. 10½ in. wide; for the remaining portion the parcels are 17 ft. 6 in. wide. All interior columns have a circular cross section reinforced with vertical Rib Bars wrapped spirally with 3/8 in. and 5/16 in. steel wire at the required pitch. The wire was shop coiled to the exact diameter required and the bars wrapped on the building site. The exterior or wall columns are rectangular in cross section and reinforced with vertical rib bars, giving the necessary sectional area of steel, and all stayed with bands of ¼-in. wire, 12-in. on centres.

Figure 1 shows a typical column footing. From this it will be seen that five continuous beam footings, running the entire length of the building, were used, the width of these beams being such as to distribute a load of 4,000 lbs. per square foot on the soil, which is a dry sandy gravel. Obviously these footings were designed as inverted beams resisting the upward pressure of the earth as a uniformly distributed load of 4,000 lbs. per square foot with column loads as reactions. A bending moment WL/8 was figured for these footing beams, 80 per cent. of the area of steel required being placed at the top of the footings in the middle of the span to provide for the tension due to positive bending and the remaining 20 per cent. of steel area at the bottom of the footings under the columns to provide for negative bending. At the ends of the building where future extensions are anticipated, the footings are cantilevered from the end columns for a distance equal to half the span of the first panel in the proposed extension.

The footing reinforcement, as shown on the

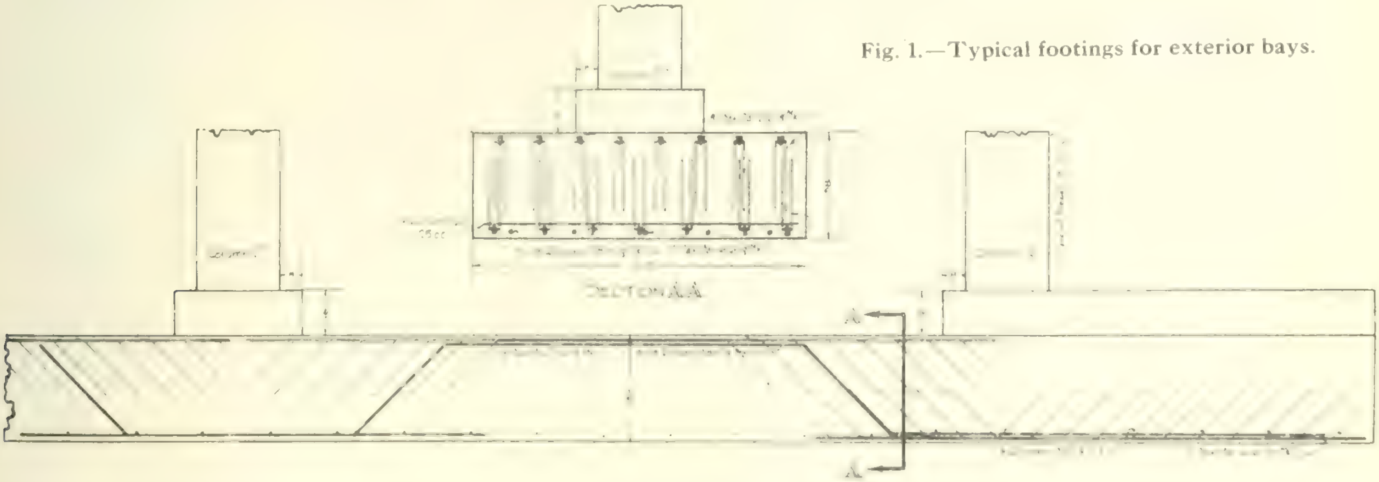

Fig. 1.—Typical footings for exterior bays.

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* Engineer Trussed Concrete Steel Company of Canada Limited, Walkerville, Ont.

[illegible], consists of 1⅛ in. Rib Bars, 9 ft. 6 in. long, spanning across the footing at the bottom spaced 25 in. on centres, distributing the load uniformly to the longitudinal main tension bars spanning from column to column at the top of the footing. These main tension bars are eight 1¾ in. x 2¾ in. Standard Shear Kahn Trussed Bars, 21 ft. 6 in. long, and five 1⅛ in. Rib Bars which are bent down under the columns and extend into the adjacent span to take care of the shearing stresses at the supports and to provide for negative bending under the columns, where the footing beams are continuous; and part of the bending due to the cantilever action in footings in the end panels. The remainder of this cantilever action is provided for by increasing the area of steel by the addition of seven 1¾ x 2¾ in. special Shear Kahn Trussed Bars, 16 ft. 6 in. long, placed in the bottom of the cantilever footing, and also by increasing the effective depth of the beam by extending the footing cap to the end of the cantilever.

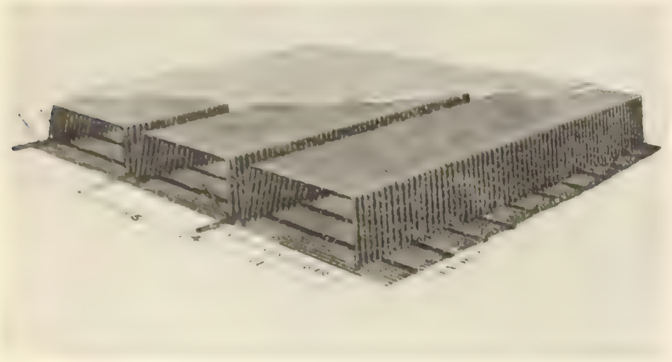


Fig. 2.—Perspective view of Floortyle slab.

A 12-in. concrete wall surrounds the basement reinforced against temperature with ½-in. Rib Bars, spaced 2 ft. 6 in. on centres, both vertically and horizontally. This wall was poured in one operation with the exterior columns.

The design adopted for the slabs throughout the building, except for the ground floor, is solid concrete flat ceiling construction, with spreading capitols at the columns. This type of design was not feasible for the ground floor owing to the many openings required in this floor and also to the complicated nature of the beam and girder construction of the callenders, vulcanizers and mill troughs, etc. In the ground floor it was decided, therefore, to use a comparatively new type of construction known as "Metal Floretyle." Figure 2 shows a perspective view of the Florestyle Slab. A complete floor of form work was not necessary with this construction, as the Hyrib used in conjunction with it takes the place of the wooden floor and prevents the wet concrete from leaking through. Thus the only centering required is a system of joists, placed approximately two feet on centres, and the necessary uprights and cross-bracing to support the dead weight of the construction. Hyrib is an expanded metal lath with raised ribs 13/16 in. high, 3½ in. on centres. This material was supplied in sheets 10½ in. wide and in convenient lengths up to 12 ft. Hyrib was placed on the wooden joist with the rib on top and the sheets lapped and interlocked at sides and ends, the ribs running parallel to the beams supporting the slab. The Metal Floretyle was then placed on the Hyrib in rows spaced 25 in. on centres, spanning between the beams and, consequently, at right angles to the raised ribs in the Hyrib. The Floretyle was supplied in length of three and four feet and was 12 in. deep and 21 in. wide at the bottom, the sides sloping to the top at an angle of 7½ degrees with the vertical. It will be seen from the sketch that the metal is corrugated and the edges of the type serrated. The serrations fit snugly over the ribs of the Hyrib and their sharp points engage the lath expansions and tend to hold the tyle in place; however, as an extra precaution and to insure a perfect alignment in the rows of tyle, holes are punched at the edge of the tyle to permit their being nailed, through the Hyrib, to the wooden joists beneath. To prevent the wet concrete from flowing into the space under the tyle, the ends of each row are closed up with steel caps manufactured especially for this purpose.

The reinforcing steel was next placed at the bottom of the spaces between the rows of tyle, the necessary temperature bars on top of the tyle at right angles to the main tension bars and the concrete then poured forming a series of reinforced concrete "T" joists 4 in. wide at the bottom between the rows of the Floretyle and a 3-in. concrete slab over the top of the tyle, thus providing the necessary amount of concrete in that part of the slab where it was required to resist compression, with a minimum amount of concrete at the bottom of the slab where it was not required. The economy in dead weight of construction is apparent.

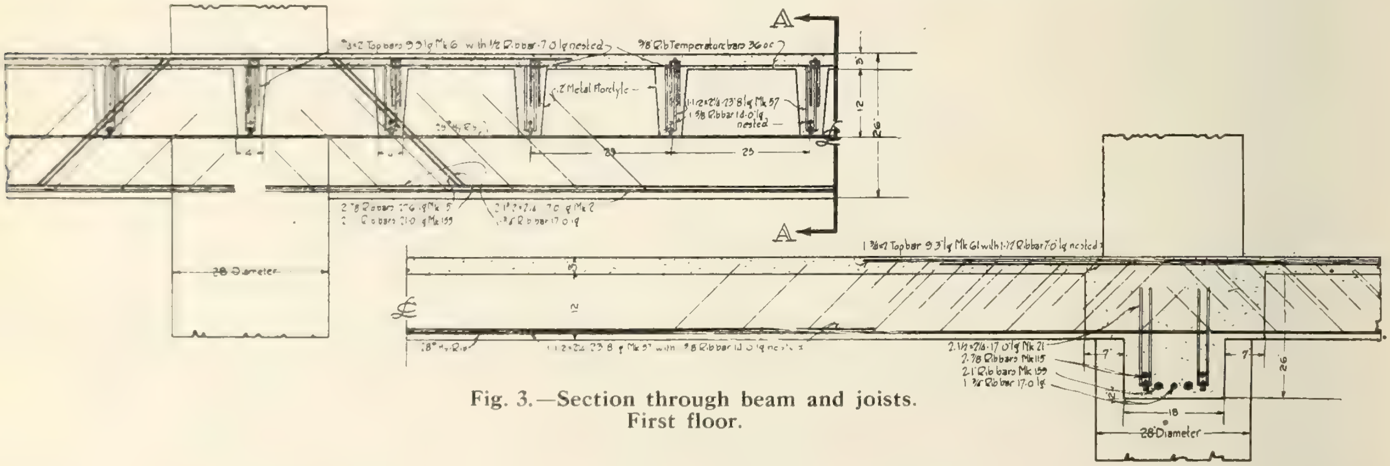

A
A
1 3×2 Top bars 9 3 lg Mk 6 with 1½ Rib bar 7 0 lg nested
⅜ Rib Temperature bars 36 o.c.
12 Metal Floretyle
1 1½×2¼ 23 8 lg Mk 57
1 ⅝ Rib bar 14-0 lg nested
3
12
26
25
25
28 Diameter
1 ⅞×2 Top bar 9 3 lg Mk 61 with 1-1½ Rib bar 7-0 lg nested
2.1½×2⅛ 17 0 lg Mk 21
2.⅞ Rib bars Mk 115
2.1 Rib bars Mk 159
1 ⅞ Rib bar 17-0 lg
7
7
26
18
28 Diameter

Fig. 3.—Section through beam and joists. First floor.

The reinforcement in each joist consists of one 1½-in. standard shear Kahn Trussed Bar, 21 ft. 6 in. long, and one ⅝-in. Rib bar, 14 ft. long, nested between the shear prongs of the Trussed Bar. The negative bending over the supports was provided against by the use of one ¾-in. Trussed Bar with prongs inverted and extending down into the lower portion of the joist to assist the concrete in resisting shear and diagonal tension. The area of steel over the supports was governed by the available area of concrete in the bottom of the joists necessary to develop it, so that the area of the steel did not exceed one per cent. of the area of the concrete. The remaining area of the steel required to resist the total moment of WL/8 was placed at the bottom of the joist with the maximum area at the middle of the span. This steel is developed by the concrete in the joist proper together with the concrete available in the "T" from the 3-in. slab over the tyle. In exterior panels, where continuity was obtained over one support only, the ⅝-in. Rib Bar used in the interior panel joists was replaced by a ¾-in. Rib Bar, which supplied the additional area required. The temperature bars used were ⅜-in. Rib Bars placed in the 3-in. slab, at right angles to the reinforced concrete joists and 36-in. on centres.

The amount of concrete necessary in this type of construction is much less than that required in other types for the same loads and spans, and for this reason its adoption was considered for the construction of the other floors in the building. A comparison between the cost of Floretyle construction and a solid concrete slab was made. This comparison showed, in this particular instance, that the solid concrete design, calling for a much greater yardage of concrete, was the cheaper. This result was due to the extremely low cost of the aggregate materials in the locality. However, a more important factor, which made the solid slab design preferable, was that speedy erection was essential and the construction had to be proceeded with all through the winter and, as a heavy concrete slab could be more economically and satisfactorily protected against frost than the thin, light slab in Floretyle construction, the former design was used for the second, third, fourth and fifth floors. The following bending moments were figured:—

Interior Panels:

Positive moment at middle of panel WL/25.
Negative moment over support WL/8 — WL/25 = WL/11.75.

Exterior Panels:

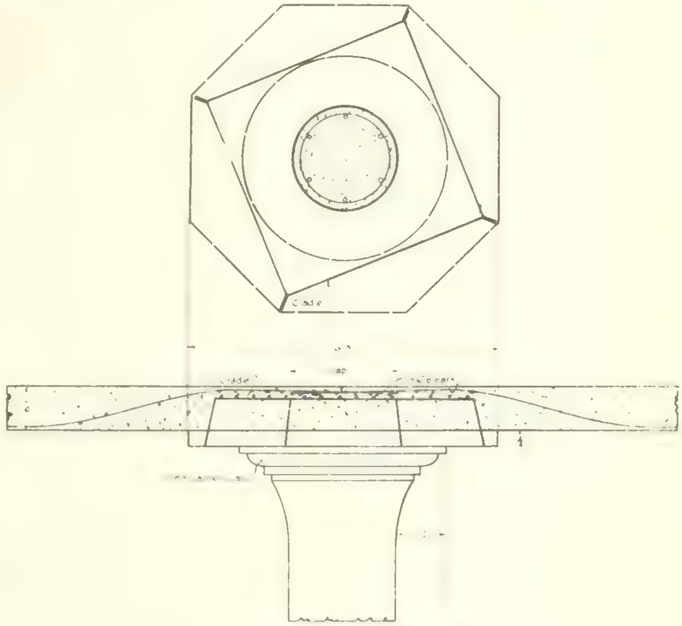
Positive moment WL/20.
Negative moment WL/8 — WL/20 = WL/13.34.
Where W = total panel load
and L = span obtained from the mean of the two sides and the diagonal of the rectangular panel measured from centre to centre of columns.

The area of steel necessary to satisfy the above moments was distributed over the panel area in four bands, two rectangular along the sides of the panel and two diagonally (see Fig. 4). The width of the longer rectangular band was made 4/10 of the width of the panel, and the width of the shorter rectangular band was 4/10 of the length of the panel. The width of the two diagonal bands was such that the total area of the panel was properly covered by reinforcement.

In the larger panels, which are nearly square, 22 ft. 6 in. x 21 ft. 10½ in., the area of steel required was equally distributed, one quarter of the total amount being placed in each band. In the smaller panels, 22 ft. 6 in. x 17 ft. 6 in., half the area of the total panel steel required was equally distributed in the two diagonal bands, while the other half was placed in the two rectangular bands in amounts directly proportional to the squares of their respective spans.

The steel was kept in the top of the slab over the columns by a cradle or cricket made up of four ⅝-in. Rib Bars, the slab bars being laid on top of the cradle and allowed to sag with their own weight to their correct position in the bottom of the slab at the centre of the panel.

The column capitols were made the required width and depth necessary to develop the area of steel brought over the columns by all four bands, figuring the required negative moments already given above.



Section of Flat Slab at Column

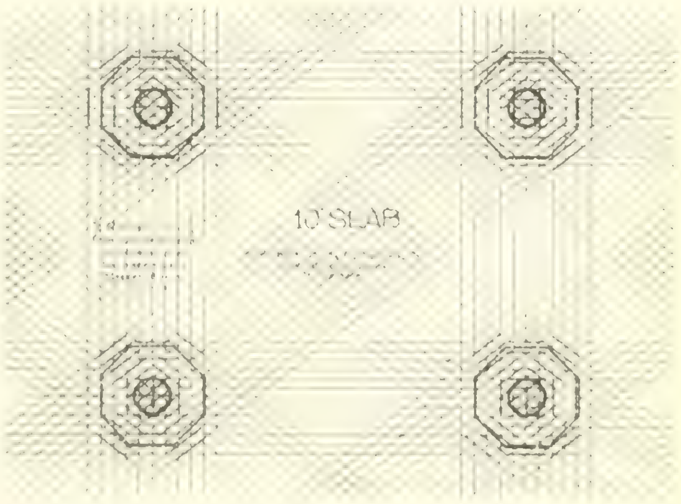


Fig. 4 Plan of flat slab panel Details of flat slab

The size of these capitols was kept constant and a minimum by increasing the slab thickness over the columns by the use of a flat octagonal cap. The dimensions of this cap in the second floor are 6 ft. 3 in. diameter and 4 ft. deep. These dimensions vary on the other floors, depending on the different floor loads. Thus, by varying the size of the flat cap, the capitols were kept the same for all columns on all floors throughout the entire building where this type of construction was used. This was desirable, due to the fact that steel moulds were used as forming for the capitols, and by keeping the capitols a constant size and shape the same steel forms could be used for any column on any floor.

The slab reinforcement in all cases consists of ½-in. Rib Bars, at the requisite spacing to secure the necessary area of steel in each band. These bars are of such length as to extend over two panels. All ends were lapped and wired together alternately over the columns. The depth of the second and third floor slabs is 10 in. and the fourth and fifth floor slabs 9½ in. and 9 in. respectively throughout the entire area of the floors. No variation in the slab thickness was made for the two different sized panels.

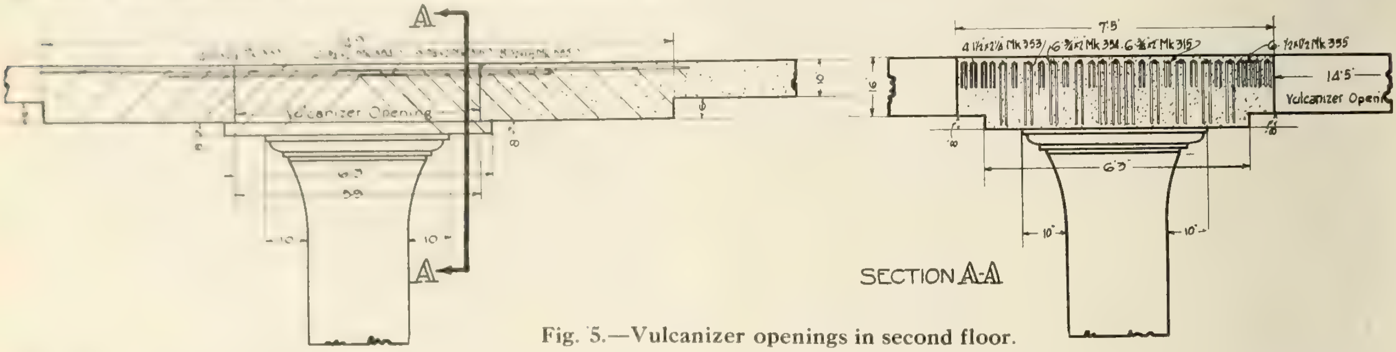


Fig. 5.—Vulcanizer openings in second floor.

Brackets were provided for all exterior wall columns. The wall beams or lintels are designed to carry the following panel loads in addition to curtain walls and sash: where continuous at both ends, a uniformly distributed load equal to ⅛ the total panel load, but not less than a load equivalent to that on a strip of floor 2 ft. 6 in. wide and the length of the lintel; at corner panels where lintels are continuous at one end only, a uniformly distributed load equal to ⅛ the total panel load but not less than a load equivalent to that on a strip of floor 4 ft. wide and the length of the lintel.

Three towers, outside the building adjacent to the rear or west wall, enclose three flights of stairs and three elevators, and therefore no floor space is sacrificed to openings for stairs or elevators. The only openings of any consequence, other than those in ground floor slab, are six, which occur in the second floor between the columns along the centre line of the building to the north end. These openings are 14 ft. 5 in. long by 5 ft. 9 in. wide and are necessary on account of the vulcanizers which are located on the ground floor and extend through the second floor slab. To properly provide for the stresses around the openings, the slab for 4 ft. 6 in. on either side of the openings was increased from 10 in. to 16 in. in thickness and reinforced with twelve ½-in. Rib Bars which carry the load to the cantilevered brackets at the columns, where the thickness of concrete was still further increased by making the flat column caps 6 ft. 3 in. square and 8 ft. deep, instead of retaining the 6 ft. 3 in. octagonal cap 4 in. deep, which was used where no opening occurred. The capitols, as usual, were kept the same size and shape. Figure 5 shows this construction and the heavy cantilever reinforcement over the columns, consisting of centre sheared Kahn Trussed Bars.

As previously stated, there are no openings of any size in the upper floors and their design presents nothing of particular interest. Mr. Albert Kahn is the architect for this structure, which is being erected by Mr. E. A. Wallberg, engineer and contractor, of Montreal. The reinforcing steel—Hyrib, Floretyle and Steel Sash, is being supplied by The Trussed Concrete Steel Company of Canada, Limited.

ELEVATORS as a means of housing and handling grain did not make their appearance until the latter part of the last century. According to Concrete and Constructional Engineering, the first real elevator of which there is any record was the "cribbed" wood type, and there are still a good many of these houses in existence. This old type is interesting when it is considered that at one time an elevator of nearly four million bushels capacity was erected complete, and almost totally filled with grain, in a period of forty-four days. Of course, lumber was plentiful, and no expense was spared and no restrictions put on the builder except to gain time. The first fire-resisting elevators were built of steel, practically on the same plan as the old wooden structures, which were rectangular in plan and had cribbed bins elevated on posts and usually arranged to suit unloading conditions. Up to this point all storage and handling devices were carried under one roof, but it was then demonstrated that all machinery for unloading, handling, and shipping could be more economically installed in separate buildings called the working house. This was accomplished by having two or more parallel tracks alongside the house for unloading, thus shortening the house and necessarily making it more economical; a separate building for storage having larger compartments than in the working houses being erected. At about this time brick, tile, and concrete came into common use in the construction of elevators.

AN unique feat in concrete construction was performed recently at Asheville, N.C., in the erection of the Grove Park Inn when a steady stream of concrete was poured through a channel for one entire week forming in one piece the concrete ceiling for the lobby and the six mammoth columns which will support it. It was necessary that there be no interruption in the pouring process and that there should be no crack or break in the solid piece of concrete masonry. By the aid of lights which were erected, workmen could work in shifts all night. About 6,000 bags of cement were used to furnish this stream of concrete.

GREAT interest is being taken in the recent discoveries at the Sphinx. Professor Reisner has succeeded in removing the accumulated sand of some sixty centuries from the interior of the head, and has gained entrance through the neck to a temple that runs the whole length of the gigantic body, measuring 120 feet in length. In this temple is a pyramid which forms the tomb of Menes, the first King of Egypt, and is supposed to contain his mummified body. Sloping passages from the temple lead to other chambers as yet unexplored and, it is thought, to a subterranean city.

The Fundamentals of Factory Design

Showing how the Efficiency of the Modern Industrial Plant is Dependent Largely Upon the Layout and Equipment

By Geo. Service, Consulting Engineer, Toronto

IT is quite unnecessary to emphasize the importance of industrial vitality, even in a country of natural products like Canada, and as an excessive amount of tariff protection cannot be hoped for, foreign competition must be met largely by merit. Success will eventually depend upon our industrial efficiency.

The efficiency obtainable will depend largely upon the lay-out and equipment of the industrial plant or factory, all of which may be classed under the term Industrial Design, having to do not merely with the design of the structure, the equipment and the power plant, but taking account of the cost of operation, as well as of construction, and in a general way the personality of the operators. Indeed it embodies the correct co-relation of the human, mechanical, structural and financial equipment.

Mr. George Service.*

The qualified Mechanical Engineer, who has had a good technical education, spent considerable time at practcial work in factories and industrial plants, and has the faculty of keen observation, is probably as well qualified as anyone to carry out work of this kind successfully, but it must not be thought from this, that a factory is simply a machine, although in some ways it does resemble one. A machine is a combination of resistant bodies, whose relative motions are completely constrained, for the purpose of transforming some form of energy into some other form; whereas the purpose of a factory is to transform material into some other form, and while it consists of a combination of resistant bodies, the relative motions of these bodies are by no means completely constrained, as anyone who has to deal with men will admit.

The efficiency of the factory will depend upon the amount of uniformity of constraint obtainable. The arranging of the plant so as to constrain, as far as possible, the uncertain human element, is one of the principal problems with which the engineer will have to deal, and introduces elements which do not enter into ordinary machine design.

Now, as a rule, men are likely to work harder and more steadily at work they like to do, and in the way they like to do it, than at some other kind of work or in some other way. This principle, properly applied, should help towards the solution of the constraint problem. For example, most men prefer to do things in what, to them, seems the easiest possible way, and if their work is arranged so that this can be done, there will be no tendency towards their doing it in any other way, and the result will be the same as if their movements were completely constrained. The same ideas can be applied to lighting, heating, ventilation, pleasant surroundings, and many other things which arise in special cases, all of which, if arranged according to the "likings" of the men will help towards complete constraint.

This is one of the principal reasons why the worker should have due consideration given him, which is now accepted as a sound business policy. But not only does it help towards maintaining an efficient system: it prevents depression and discontent, and tends towards a higher value of human effort.

This of course means that the engineer must have a fairly extensive knowledge of the ideas and ideals of the worker, as well as of the process of manufacture to be employed, even to the extent of acquainting himself with the details of work in the various departments, before undertaking to layout a factory plant.

The site chosen and the power used are largely financial considerations, and need not be considered at length in this article. The site should have adequate shipping facilities and must have good drainage. Electricity as the motive power is coming more and more into general use, either purchased from a public supply company or produced at a private plant. The flexibility of electric transmission is much in its favor, but it is not always the most economical, a great deal depending on the locality. When the amount of power for individual drives is small it has been found almost always advisable to group them, as is indicated by the marked increase in the average size of motors used in industrial plants in recent years.

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*Mr. George Service came to this country from Scotland. He has had over twenty years' technical experience in connection with large engineering and manufacturing plants, this period having been divided about equally between Scotland and Canada. At the outset of his career, Mr. Service showed unusual ability. In 1898, while studying mechanical engineering at the Royal Technical College, Glasgow, he won a Whitworth scholarship. These scholarships, each worth $1,875, were founded by the late Sir Joseph Whitworth and are open for competition to engineering students in all parts of the British Empire, only four being awarded each year. After completing his apprenticeship as a mechanical and structural engineer, Mr. Service served three years as assistant engineer with the Steel Company of Scotland. Coming to Canada, he made connections as superintendent with the I. Matheson Company, Limited, engineers and boiler makers, New Glasgow, N.S., with whom he remained for three years. As Works Engineer he served the Canada Foundry Company for two years. During the last three years he has designed and equipped several large plants, the largest of these being the one described in the above article

As a rule, the construction desiderata of factory buildings are simplicity, strength, rigidity, durability and fire protection, all at the lowest possible cost. Usually, these can be taken care of by the engineer, and as there are many special stresses due to machinery, etc., with which he is better acquainted than anyone else, it is usually advisable that he should do so. When, however, elaborate architectural work is desired to give the buildings a fine appearance on the outside, an architect should be consulted—but this properly does not comeunder the heading of "Factory Design," as it contributes nothing to the efficiency of the plant, and the additional cost should be charged against the advertising account. From the manufacturing point of view, how the factory looks from the inside is of far more importance than its outside appearance.

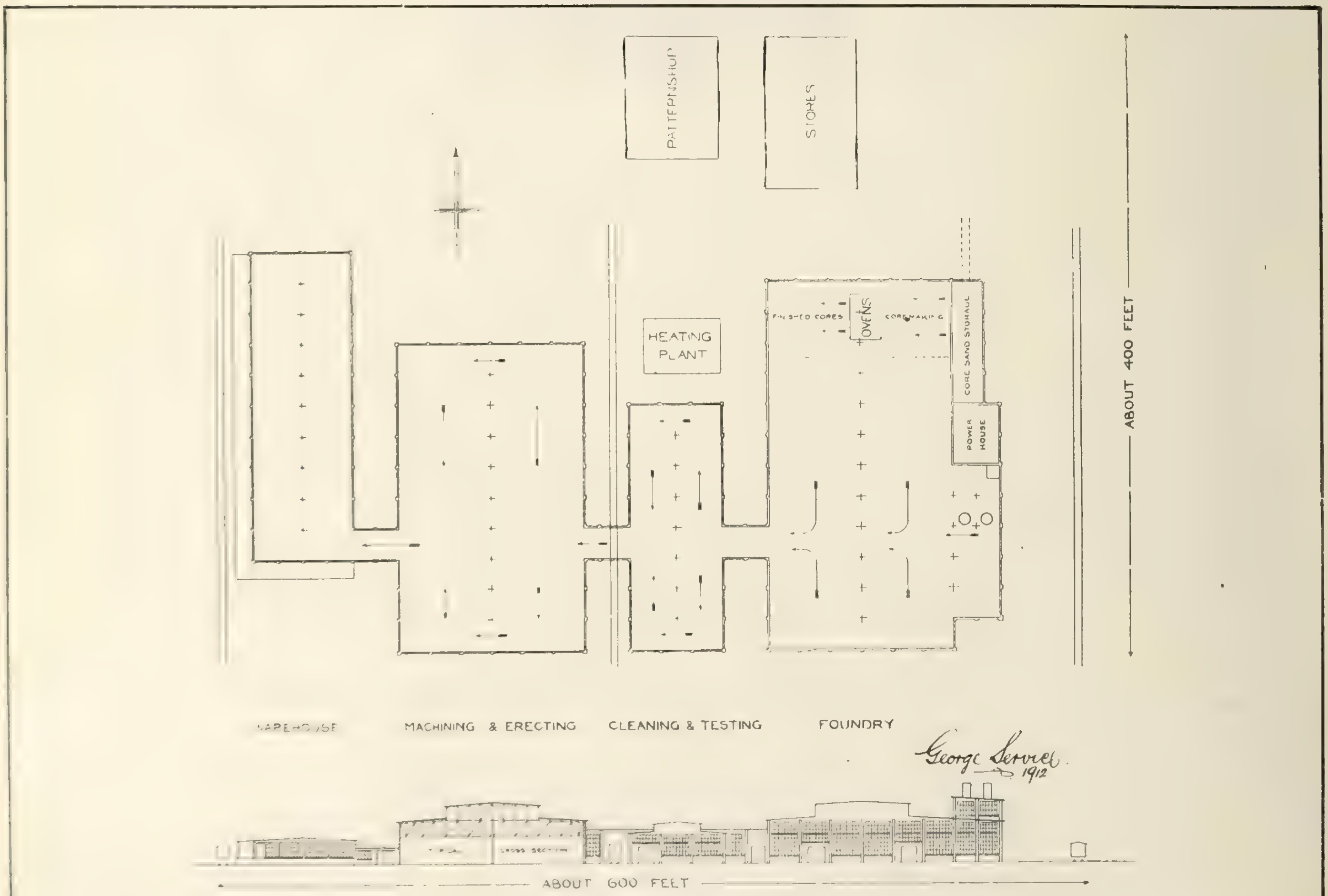
On account of the rapid development of the country it is important that ample provision be made for extensions. In most cases it is practically impossible to estimate the necessary ultimate capacity of the factory, and it is usually inadvisable, on account of cost, to build much larger than immediate requirements. The lay-out should be such that extensive additions can be made without interfering with the continuous running of the plant, and when finished should be capable of incorporation with the original portion without making any change in the scheme of operation.

In order not to handicap the chances of financial success, before the arrangement of the plant is finally approved, careful estimates should be made covering the initial cost, operating and maintenance costs, and even of the profits. In this connection the immediate output that can be profitably marketed is a more important consideration than the output which the factory is capable of producing.

Briefly then, any projected industrial plant should be the subject of careful preliminary consideration, so that, when built, it will be found to be well-arranged and equipped, properly situated with regard to raw material and markets, and having ample provision for future extension, and for the health, comfort, and contentment of the employees. Under such conditions, and with a sound commercial organization and management, there should be willing co-operation between employer and employee, and assurance of financial success.

The New Plant of Steel & Radiation, Limited

The following description of a plant, recently designed by the writer and now in operation, may be of interest, as it embodies the principles mentioned above. This plant has been built at St. Catharines, Ont., by Steel and Radiation, Limited, of which Sir Henry M. Pellatt is president, for the manufacture of "King" boilers and radiators. In the preparation of the plans, the writer had the active co-operation of Mr. R. J. Cluff, the general manager of the company, and of Mr. W. A. Jackson, the general superintendent. The whole scheme was thus considered from the financial, operating, and engineering points of view. This has done much towards making the plant the



General plan, Steel and Radiation plant, St. Catharines, Ont.

most up-to-date of its kind. The nominal capacity is one hundred tons a day, but will eventually far exceed this amount.

The principal departments are (1) foundry, with core department; (2) cleaning and testing department; (3) machining and erecting department; (4) storage warehouse and shipping department. These four departments are arranged as separate buildings, in the relative position shown on the plan, but are connected by covered passage-ways, making the whole under one roof. The type of construction adopted throughout has been steel frame with brick curtain walls, and "Fenestra" sash (manufactured by Steel and Radiation, Limited), the sash in the monitors running the full length of each building. The foundry floor is of hard brick, and the others of maple on a tar-concrete foundation.

Steel and Radiation plant. Central passage and part of machine shop.

In order to make the surroundings as pleasant as possible, clear glass has been used throughout, and a sill height of about five feet adopted for all the windows. With this arrangement there is no tendency for the men to have their attention taken up with things going on outside, but they are not prevented from looking out, although they seldom do, and the "shut-in" or "prison" sensation which accompanies high sills and opaque glass is avoided. Besides this, the windows are large, about 17 feet x 17 feet in each 20 feet bay, and one has almost an "out-of-doors" feeling when inside the building, a sensation which is helped by the ample ventilation provided. Two interior views are shown, one of a section of the foundry and the core-making department—usually the dingiest departments in a plant of this kind, and the other showing the central passage-way, looking from the warehouse towards the foundry, a part of the machine shop showing in the foreground. Comment on these views is needless, as they show quite plainly the excellent "daylight" effect resulting from the use of "Fenestra" sash.

The arrows indicate the direction of flow of the product to the warehouse, the general direction being across the buildings, an arrangement which allows of any of the buildings being extended in either direction, at any time, without interfering with the continuous operation of the plant, or modifying the general plan.

Of course, these advantages were not obtained without some additional cost. Placing the buildings 30 feet apart meant additional walls, besides the passage-ways, increasing the first cost by about 3 per cent., and also entailing a greater heat loss during the winter. But the advantages gained were considered to be worth this increase. It might also be noted that the arrangement practically does away with roof gutters and hoppers, which are usually a source of trouble from cinders and ice.

As the equipment of this plant is for special work a detailed description would not be of general interest, but there are several features worth noticing.

The core-making department has been placed right inside the foundry building, with sand storage bins alongside and also inside the building, doing away with the necessity of digging sand out of a frozen heap in winter. The railway cars containing sand are placed on an elevated track, and the sand is dumped from them directly into the bins, greatly reducing the cost of unloading. The sand is taken directly from the bins to mechanical mixers alongside, and from there to the core-makers benches. The cores when made are placed on cars, standing close to the core makers, on which they remain till baked.

The design of the core ovens is one of the "features" of the plant. They are built so as to get a uniform heat distribution all over the bottom of the oven and up the side walls, guaranteeing an even temperature and uniform baking throughout the whole oven, and practically no risk of burning the cores. The ovens now built occupy a floor area of less than 800 sq. ft. and were originally intended to serve a moulding floor area of about 20,000 sq. ft., but they have proved so efficient that they can take care of nearly twice that amount, and, in addition, the fuel consumption is much less than was anticipated.

The cores pass right through the ovens when baked, coming out on the side marked "finished cores" on the plan, where they are assembled and stored ready for distribution throughout the foundry.

In the foundry the moulding floors are arranged in rows, running north and south from the central passage, i.e., lengthwise of the building. One end of each floor thus adjoins the central passage, from which the molten metal is distributed, and to which the castings are returned, allowing the floors to be quite independent of one another. I-beam trolley hoists have been provided where required.

Steel and Radiation plant Foundry and core department

The blowers, air compressors, and machine for operating the elevator (for cupola charging floor), are all placed in a separate room (power house), which can be kept clean, and the elevator machine is placed on the floor where it will receive proper attention, and not in some out-of-the-way place at the top of the elevator shaft.

The sand blast and exhaust tumbling barrels are used for cleaning the castings. When cleaned, all castings which will eventually have to stand water, steam or air pressure, are subjected to a hydrostatic test before being taken to the machine shop. This work is done in the building marked "cleaning and testing."

The whole factory is heated from a central heating plant, placed as centrally as possible in a separate building. All the furnaces and fans are situated in this building, and the hot air is carried by underground and overhead ducts to the various departments. Instead of the usual steam-heated coils "Areotube" heaters, made by Steel and Radiation, Limited, have been installed. In these the air is heated direct, and many advantages are claimed for them which need not be discussed here, but two dealing with factory design are obvious: (1) there will be no trouble from leaky steam pipes; (2) there is no water to be drained off to prevent freezing when not in use, and to shut down the heating plant simply means drawing the fires and stopping the fans.

In conclusion, it may be stated that this plant has now been in operation for several months, and the results so far have amply justified the design adopted.

Large Reinforced Concrete Water Tower

One of the Most Noteworthy Structures of the Type on the Continent — Features of Design and Construction

By A.W. Connor, Toronto*

THERE has recently been erected at Berlin, Ont., a reinforced concrete water tower that is one of the largest structures of this kind in America. The capacity of the tank is 500,000 Imperial gallons and the height is approximately 125 feet. The site of the new tower is in the factory district of the city, and one object of its erection was to maintain a more uniform water pressure for fire purposes. The Berlin water works system was originally built in 1888 by an American company having little faith in the future growth of the place, and in course quence the mains are small. The old standpipe is only 16 ft. in diameter.

The new reinforced concrete structure is composed of a tank 50 feet in diameter, holding a depth of 40 feet of water. This tank is supported on a cylindrical shell enclosing a large circular room. The diameter of this room is 40 feet and connections have been left in the supply pipe to the tank so that at some future time, if necessary, a booster pump can be installed. This pump will be operated by an electric motor on Niagara power. Then, in case of a large fire, the water tower will be turned off and the water forced back into the mains again with an increased pressure of about 50 lbs. per square inch. Since the new water tower has been in use the water pressure has remained almost constant. Figs. 1 and 2 and photo 3 illustrate the construction.

The tank is covered with a spherical dome 4 in. thick. The important feature of the design consists in using the arch principle, instead of deep girders in the construction of the tank bottom. The economy consists in reducing the span and balancing the thrust of the inner dome (of 40 ft. diameter) against that of the projecting portion or inverted dome (an inverted truncated cone). See Fig. No. 2. The span and rise of the inner dome is so figured that the thrusts are about equal when the tank is full. When empty the thrust of the inverted dome will be the greater and will cause compression in the supporting ring. Instead of the supporting shell, similar tanks are supported on columns and a circular girder. As it is difficult to construct sway-bracing in concrete, these columns have to be heavily reinforced, so the cost is greater than for the shell. As the space inside the shell could be utilized, this type of construction was adopted.

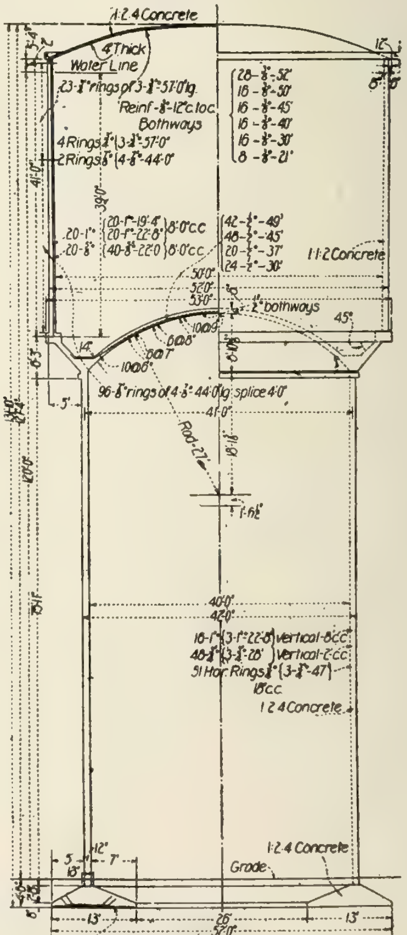


Fig. 1—Sectional elevation of tower

The concrete tank is still somewhat of a novelty in this country, though they have been extensively built in Europe. The chief objection to them has been the difficulty of making them water-tight. Once this has been accomplished, the concrete tank has the advantage over the steel or wooden tank in giving a much greater length of service, probably being everlasting, and requiring nothing for maintenance. Being a poor conductor of heat, it will prevent much freezing in winter and keep the water cooler in summer. The Berlin tank is waterproof and very little ice was formed in it last winter, while the old steel stand pipe which is also still used was cut off for a time by ice.

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*Of Messrs. Bowman & Connor, Consulting Engineers.

All concrete in contact with the water was mixed in the proportion of 1:1:2, and the remaining concrete was of 1:2:4 mixture. To prevent danger of leakage at the joints between each day's work, a 6 in. strip of No. 28 gauge metal was set half way into the concrete, the other half being filled in the following day. These strips of metal were in lengths equal to half the diameter of the tank.

The water mains enter the tank at the centre of the inner dome. The supporting shell has a door and several windows and a ladder inside leading to a small door near the top leading to a platform outside. From this a ladder leads up to a manhole in the roof of the tank.

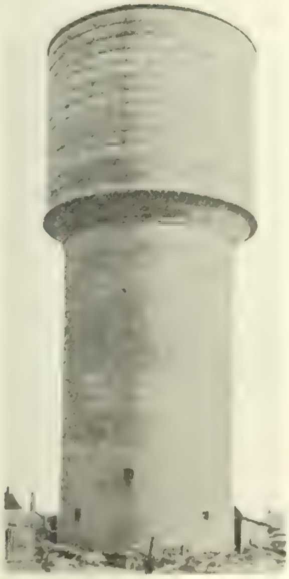

Fig 3—Berlin water tower.

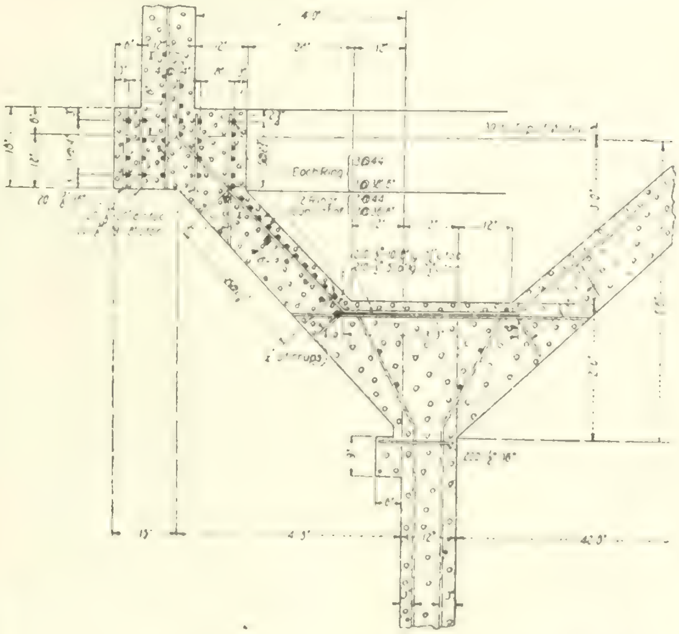

Fig. 2—Detail of concrete reinforcement at intersections of outer dome.

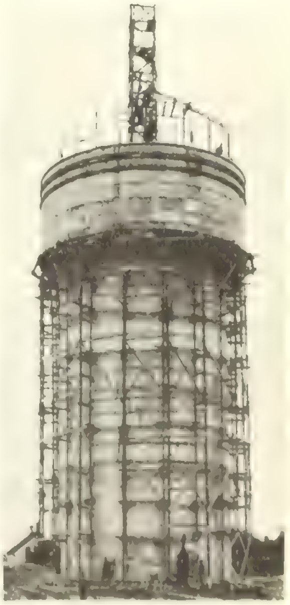

Fig. 4 Berlin water tower.

The lower shell was built by means of wooden forms, 6 ft. deep, which were suspended from 1 in. rods embedded in the concrete about 8 ft. apart. These rods also served as vertical reinforcement with the ¾ rods at 18 in. C. to C., and also as a support for hollow screws used to raise the forms. It was found that not more than 4 ft. to 6 ft. could be concreted in a day.

The forms for the inner and inverted domes were supported on 6 in x 6 in. Norway pine posts at 10 ft. centres. The forms for the tank proper were in 20 sections 3 ft. 1 in. high, held in by ordinary tank hoops, see Fig. 4. Two sets were used on top of one another, and moved up alternately. The concrete plant consisted of a chain belt mixer placed near the centre of the tank, which discharged the concrete into a hoisting bucket. The bucket ran inside of a wooden tower which was built of four 4 in. x 6 in. uprights suitably braced and 140 ft. high. It was raised by means of a hoisting engine placed about 50 ft. from the centre of the tank and outside of the structure. The hoisting bucket discharged the concrete into a hopper, which was also placed inside of the hoisting tower, and from here was spouted through a system of pipes and flexible spouts into place. The hoisting tower placed in the centre necessitated an opening in the bottom and the roof of the tank. These openings were closed and concreted after the rest of the structure was finished.

Following are a few notes as to the method of computation. The load on the roof dome, consisting of dead load and 40 lbs. of snow, is carried as a thrust in the concrete and tension in the steel at right angles. This latter is to be sufficient to keep the resultant thrust in the neutral plane, thus eliminating any bending moment. At the circumference, this thrust is taken up by steel in the upper concrete ring. This is similar to the outward pressure of the water in the tank. This ring tension is equal to the unit pressure by half the diameter. This tension at the upper ring was 67,500 and there were 4 in. steel to take this. This compression in the concrete was 61 lbs. per sq. in.

In the tank, the total tension was figured as taken by the steel (high carbon) stressed to 14,000 lbs. sq. in. Taking e = 15, this means that the concrete would be stressed to 285 lbs. per sq. in. It is necessary that this be kept within safe limits to prevent cracks that might cause leakage. The weight of the roof with snow, tank walls, main ring at base of tank and water in the latter is 1,465,000 or 9,152 lbs. per lineal foot. This is resolved into its two components, namely, a compresion down the inverted dome, and a horizontal tension. The latter is then taken up as before as ring tension. Allowing for a wind pressure of 30 lbs. per sq. ft. on the projection of the tank and water pressure on the ring, the total ring tension is 311,250 lbs. requiring 22 sq. in. of steel. Three 1 in. rods 57 ft. 3 in. long with laps made the circuit. The laps were staggered. The compression down, the inverted dome is 15,000 + 1,930 for wind. In addition there is a vertical load of 6,120 lbs. per lineal foot on this inverted dome and a horizontal water pressure of 5,270. These three vertical loads cause a total compression in the inverted dome of 25,580 or 187 lbs. per sq. in., and a ring tension of 140,800. The horizontal component adds 121,500 lbs., thus requiring 18.7 sq. in. of steel in the inverted dome.

The total weight on the inner dome is 3,344,800 or 26,650 lbs. per lineal foot. The compression in the concrete is 237 lbs. per sq. in. The thickness of this dome varies from 8 in. to 13 in. The horizontal thrust per lineal foot is 24,400 when the tank is full and 1,500 lbs. per lineal foot when empty. The corresponding horizontal thrusts from the inverted dome are 21,000 when full, and 8,820 when empty and without snow load. When the tank is full there is, then, a ring tension of 70,000 lbs. requiring 5 sq. inch of steel. When the tank is empty, this changes to a compression of 150,000 lbs., of 162 lbs. per sq. in. Wind pressure would increase the ring tension 81,000.

The total weight at the base of supporting shell is 7,942,500, giving a compression of 428 or with wind pressure 488 lbs. per sq. inch, neglecting reinforcement.

The footings are 13 ft. 6 in. wide and figured so that the centre of pressure is under the supporting shell. The load on the ground is 5,480, or with wind 6,400 lbs. per sq. ft.

There are 916 cu. yds. of concrete in the structure and the contract price was $23,500. The work was begun in August and finished in November, 1912.

The tank was built by Mr. J. L. Mensch, M. Am. Soc. C.E., who submitted a tender with a design in competition with a steel tank. As his tender was lower by the cost of foundations for the steel structure, the Water Commissioners referred the question to the engineers. After examination of similar structures in the United States, and after checking and revising the plan, the engineers recommended the construction of the concrete structure.

Messrs. Bowman and Connor, Toronto and Berlin, were the engineers, and Mr. Pequegnat was the inspector.

The C.P.R. Head Office Building at Toronto

By A.H. Harkness, Consulting Engineer, Toronto

THE Canadian Pacific Railway Company's new office building in Toronto is situated at the south-east corner of King and Yonge streets. It occupies a site of seventy-five feet on King street by one hundred feet on Yonge street. The building is fifteen storeys high above the street line, with a mezzanine floor between the first and second floors and another over the fifteenth floor, both in the south end. The first storey is 26 feet high, the second 14 feet, the third 13 feet 3 inches, and the top 18 feet, while the remainder from the fourth to the fourteenth are each 12 feet 3 inches. The basement and sub-

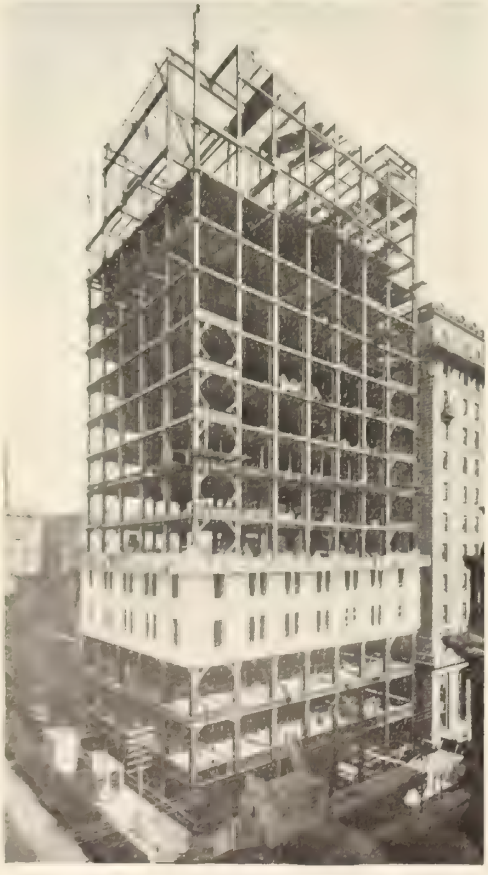

Fig. 1—Constructional view C.P.R. office building.

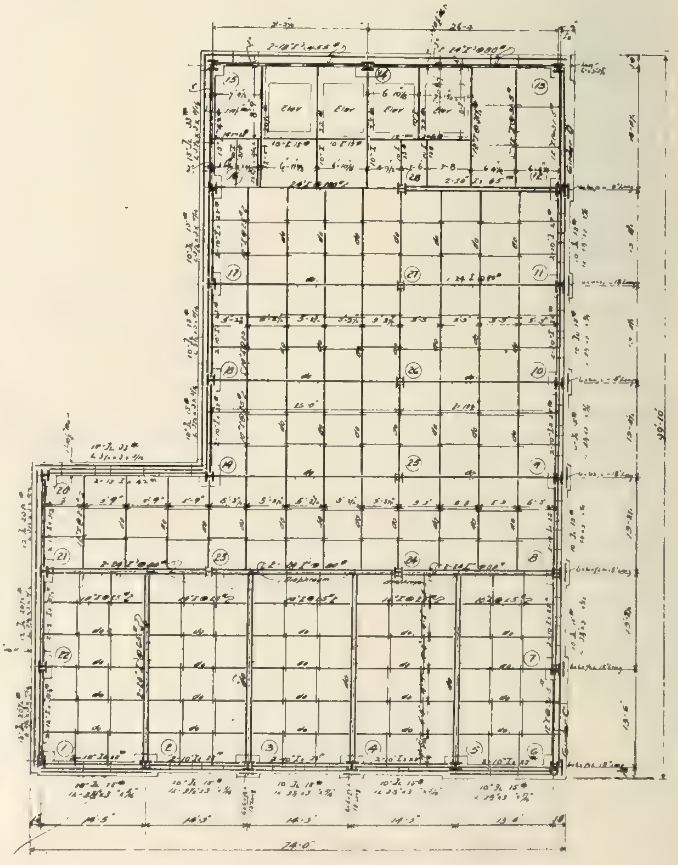

Fig. 2—Typical floor framing plan.

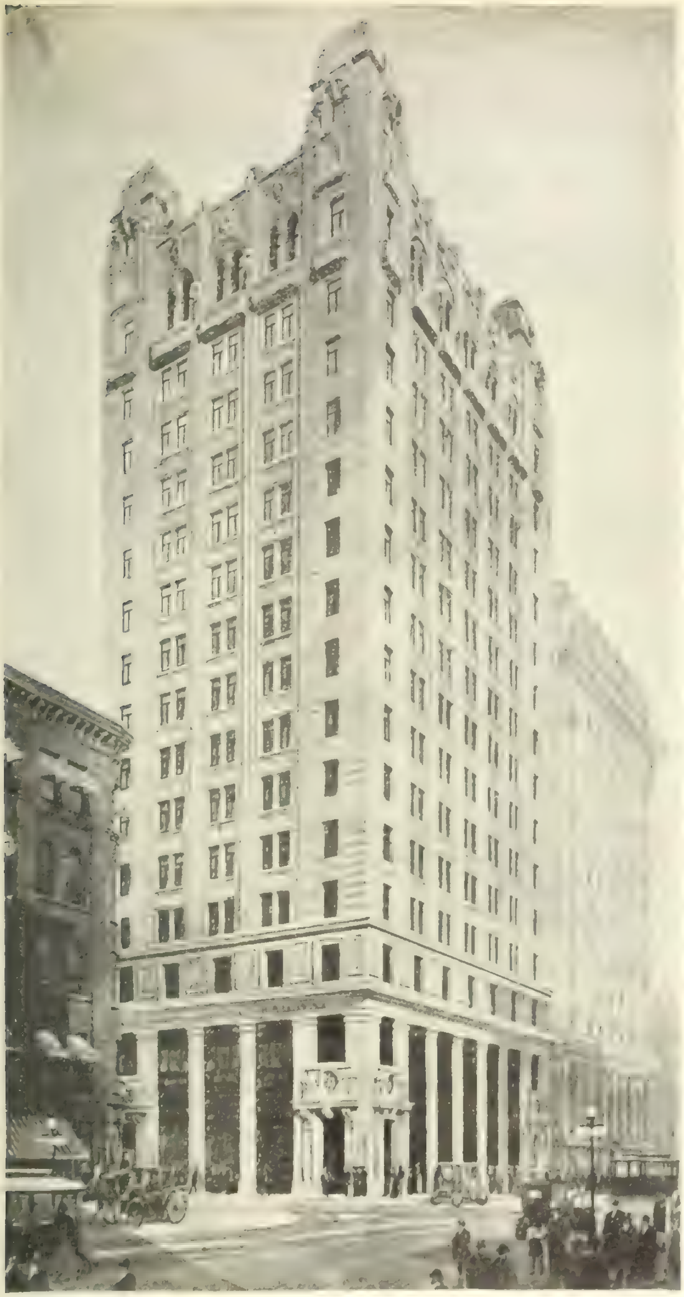

Fig. 3—Architects' perspective of finished building.

basement are 12 feet 6 inches and 11 feet 6 inches respectively, making the total height of the building, from sub-basement floor to roof, 240 feet. The height of the parapet wall above the street level is about 220 feet, and of the top of the corner towers, 245 feet.

The building is of typical skeleton construction. The walls of the first two storeys are of granite, and of the remainder, brick, faced with glazed terra cotta. The floors are constructed of 12-inch hollow tile finishing two inches below the bottom of the floor beams. The ceiling is plastered directly on the bottom of the tile and the floors are finished in concrete. The suspended ceilings over the boiler room and the fifteenth floors are of metallic lath and plaster, supported on T's hung from the steel above.

The problem of foundations was a comparatively simple one. A pier for each column was carried down to rock at a distance of about thirty-nine feet below the street level, or fifteen feet below the sub-basement floor. The excavation was through a very stiff, dry, blue clay. No shoring was required for the excavation for the piers and they remained free from water clear to the rock. The piers were made rectangular or square in cross-section and were filled with a concrete of one-two-four mix on which a load of 350 pounds per square inch was allowed. The heaviest column load is that on columns 23 and 24 with a load of 1010 tons on each. The column loads were distributed over the tops of the piers by steel grillages, of two tiers of beams. In order to get sufficient area of web in the top tier of beams under the load to resist crushing, cast iron bases were used. They were all made the same size, 36 inches square and 18 inches high. Fig. 4 shows the foundation plan of the building. The only columns adjoining other private property are Nos. 1, 20, 21, and 22. The loads on these columns were comparatively light and the piers for these were made rectangular with the centre of the pier under the centre of the column. For column No. 21, on which the load was 740 tons, to avoid making the excavation too long next to the 4-storey wall of the adjacent building, the pier was made five feet wide, thus throwing the centre of the column 10 inches off the centre of the pier, as shown on Fig. 4. The column was carried on a cantilever of 4 24-inch beams at 100 lbs., which extend back to and under column No. 23.

Fig. 2 shows a typical floor framing plan, being of the fifth and sixth floors. The floor beams were gen-

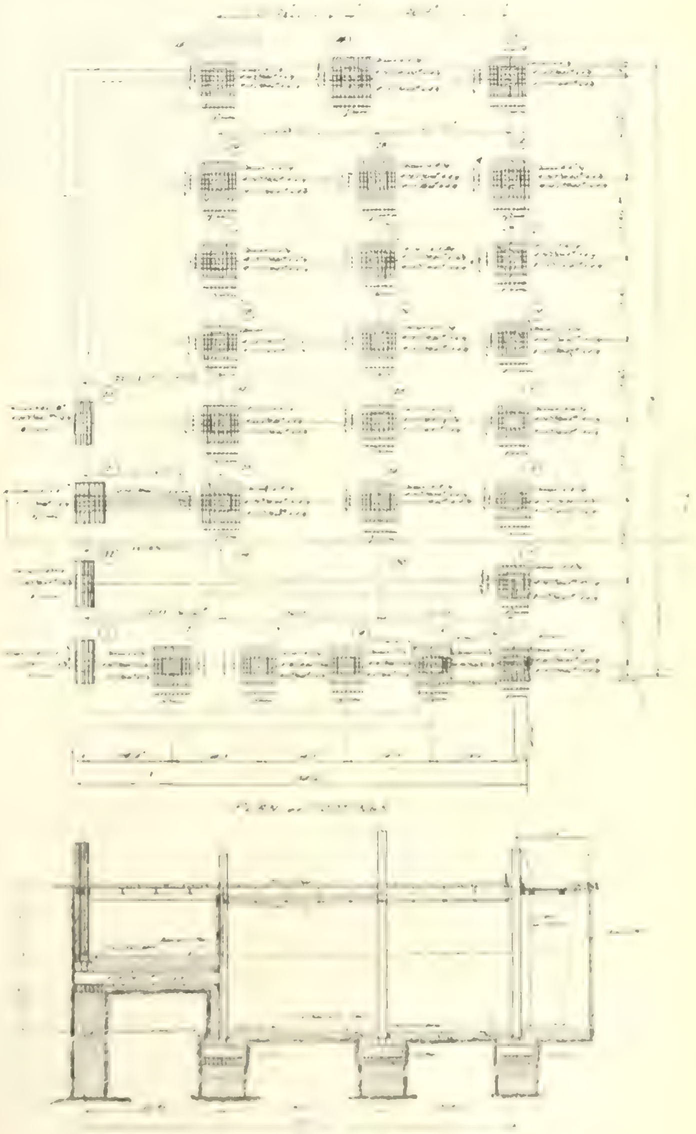

Fig. 4—Foundation plan C. P. R. office building.

cally of 10-inch I beams and the girders of 2 20-inch and 1 24-inch I beams. The spandrel sections consisted generally of an I-beam and a channel with an angle rivetted to it to carry the terra cotta. The terra cotta over the window heads was hooked up to the angle. The floor beams were framed flush on the bottom.

The columns were built of plates and angles. The largest, Nos. 23 and 24, required an area of 167.26 square inches each and were composed of one web plate 16 in. x ¾ in., four angles 8 in. x 8 in. x ¾ in., six cover plates 18 in. x ¾ in., two cover plates 18 in. x [illegible] in., and two plates 14 in. x ¾ in. on the web. The columns in outside walls were placed with webs at right angles to the face of the wall. While this arrangement was not so convenient for connections, the effect of the eccentric loading on the columns was much less than if they had been placed parallel to the wall. The connections between the beams and columns were made with brackets under and lugs over the beams.

Bracing to resist wind pressure was provided for in both directions. It was braced cross-wise by diagonals between columns 32 and 23 and columns 24 and 8 at the north end. It was braced length-wise by knee braces and girders between columns 6 and 2 and columns 12 and 13 on the Yonge street elevation, as shown in the photograph, Fig. 1, and by diagonals between columns in the east wall. A 36-inch girder was carried round the King and Yonge street faces at the second floor with rigid connections to the columns. The city building by-law requires wind pressure at 30 pounds per square foot and allows a unit stress in the steel for the wind pressure 50 per cent. in excess of the unit stresses for the live and dead loads. The wind pressure was figured at 20 pounds per square foot, and the steel was designed to resist it at the ordinary working stresses, giving the same result as if it had been figured as specified by the Building Department.

The steel work was erected by a ten-ton guyed derrick with 90-foot mast and 80-foot boom. The derrick was set at the centre of the building and from this position could reach all parts. The steel was delivered to the job on waggons on King street and lifted directly to position by the derrick. The columns were constructed in two-storey lengths and the floors were erected two at a time from the outside to the centre of the building.

Messrs. Darling & Pearson were the architects on the building, and Messrs. Harkness & Oxley, the consulting structural engineers. The Geo. A. Fuller Company had the general contract and the steel was supplied and erected by the Dominion Bridge Company.

A very simple method of seasoning timber, given by a French contemporary, consists in saturating it with linseed or other drying oil and exposing it for a sufficient time to moderate heat. After cooling, the timber is found to be smooth, glossy, and hard. It is also stated that by removing the bark when the sap is in full flow, some months before trees are felled, the strength of the timber is augmented by about 15 per cent. Another method of treating timber is to strip the trunk down to the sapwood immediately the tree has been felled, cutting it into planks, soaking these for six days in lime-water, and afterwards drying in the open air, sheltered from the sun. Timber seasoned in this manner is said to suffer far less from the effects of atmospheric conditions than timber dealt with in the ordinary way.

Office of Dominion Iron & Steel Co., Ltd., built of Sydney pressed brick.

An Up-to-date Brick Plant at Sydney, N.S.

One of the up-to-date plants of the Maritime Provinces is that of the Sydney Pressed Brick Company, Limited, Sydney, N.S. This plant is situated on an arm of Sydney Harbour at a junction of the Intercolonial and the S. & L. Railways and has excellent facilities for shipping by rail or water. It is of special interest by virtue of the claim made for it that it is the only plant in America manufacturing pressed building bricks from slag.

The bricks are manufactured from basic blast furnace slag, a by-product of the Dominion Iron & Steel Company's blast furnaces. This slag is admirably adapted for the purpose. It contains about 50 per cent. lime, 30 per cent. silica and 13 per cent. of alumina and ferric oxide. The molten slag is brought in contact with water and is thereby granulated and brought to a condition appearing like coarse sand. This water-granulated slag goes through a special preparation when a small percentage of cement is added, and is treated in a manner similar to the process of making sand-lime bricks. The result is a pressed brick which is like an artificial stone. Age and exposure to weather have the same effect as on good concrete, namely, that of maturing and hardening. The bricks take an exceptionally good bond with mortar.

The officers of the Sydney Pressed Brick Company, Limited, are: president, Mr. H. C. Burchell; vice-president, Mr. C. S. Cameron; directors, Messrs. C. S. Martin, Thomas Cozzolino and C. J. Burchell; secretary-treasurer, Mr. H. H. Jost.

County Academy. Sydney, N.S. Built of Sydney pressed brick.

Winnipeg—The Metropolis of the West

Interesting Features of Engineering Development—Drainage and Waterworks Systems – Paving and General Statistics of the Various Departments—Appropriations for 1913

THE constructional development of the city of Winnipeg was featured extensively in our issue of January 29 last, but the City Engineer, Col. Ruttan, has kindly furnished us with the following additional interesting data concerning the practice and equipment of the various branches of his department, prefacing the same with a few interesting topographical and other notes.

Winnipeg is situated at the junction of the Assiniboine and Red rivers and lies at a point about equi-distant from the international boundary and Lake Winnipeg. The city lies in latitude 49 deg. 54 min. north, longitude 97 deg. 08 min. west and is generally level, extending 7 miles from north to south and three and one-half miles from east to west.

The area within the city limits, not including the portion covered by water, is 15,170 acres, and the population is 190,000.

The drainage system of the city is the combined system, there being 216,148 miles of sewers.

City Engineer Ruttan,* Winnipeg.

Waterworks.—The waterworks system is owned and operated by the city, the supply being obtained from artesian wells. The cost of the system to date is estimated at the amount of $4,664,000.

An elevator fitted with a rotary feeding gear to ensure regular feed without choking, raises the coal to a horizontal conveyor placed above the producer hoppers. The elevator and conveyor are operated by an eight h.p. steam engine. Two air superheaters, 18 ft. 10 in. x 5 ft. 3 in. and 18 ft. 10 in. x 4 ft. 3 in., with gas and air connections and dust collectors are attached to the producers. Each unit is supplied with a hot gas tubular boiler. Four wet scrubbers, each 30 feet high by 5 feet in diameter, fitted with tar sieves and filled with coke, remove the condensable hydro-carbons from the gas. Three centrifugal tar extractors, five feet in diameter, complete the removal of the tar from the gas. Two sawdust scrubbers, 9 ft. x 22 ft., either of which is capable of removing any remaining impurities from the gas, are placed near the inlet to the gas holder. In addition to the above, centrifugal circulating pumps and Root air blowers are provided. An important feature of the installation is that there is a spare unit of each type of machine, so that in case of a breakdown, the plant can still be operated to its rated capacity. Two steam boilers, of about 50 h.p. each, furnish what additional steam is required for the producer, and also drive the elevator and blowing engines, and supply steam for heating the buildings.

A gas holder of 250,000 cubic feet capacity stores a reserve of gas, either producer or city gas, sufficient to operate the whole plant for from 1½ to 5 hours. This will give ample time to fire additional producers or to make provision for the use of the city gas in case of a long-continued fire. It is not likely that more than half the capacity of the plant will be required except in extraordinary cases.

The mains are designed to withstand the ordinary working pressure of 300 lbs. per square inch, and water hammer. They were tested to 700 lbs. per square inch at the foundry, and after being laid were tested to from 500 to 700 pounds. The pipes were provided with extra heavy hubs and two lead grooves. These joints have given entire satisfaction.

The hydrants are connected to the mains by eight-inch flanged nozzles with independent gates. These nozzles, when required, are reduced to 3½ in. and 2½ in. by suitable reducers, 3½ in. being the largest hose now used. The hydrant valve is eight inches in diameter and is provided with 1-in. pilot valve to fill the hydrant before opening the main valve against the pressure. Both the valves are operated by the same stem. Each hydrant connection is provided with a gate valve so that the hydrant may be cut out from the system in case of necessity, or for any purpose for which it may be expedient.

Fire Service Water Works

Pumping Station.—The pumping station is situated on the bank of the Red River at the foot of James street, and contains the following equipment: 4 Crossley 2-cylinder tandem gas engines 540 h.p. each; 2 Crossley 2-cylinder tandem gas engines of 250 h.p. each; air compressing starting plant in duplicate; 1 producer gas main supplying all engines; 1 city gas main, in reserve, supplying all engines.

The engines above described drive six triplex double acting pumps. The pumps are furnished with suction and discharge mains, 20 inches in diameter, in duplicate, all pumps being connected with both mains, either main being of sufficient capacity for the whole plant. The pumps take their water from a well, which is divided into two compartments, either of which will supply the whole plant. The water is conducted to the well by an intake pipe, 3 feet in diameter, which extends for a distance of 425 feet from the well to the deep water in the river, where it ends in a stone ballasted crib.

Producer Gas System

Power is supplied from a gas producer plant which consists of four Crossley type producers—two of 500 h.p. each

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***Lieut.-Col. Henry Norlande Ruttan** has been City Engineer of Winnipeg for more than a quarter of a century. He was born at Cobourg, Ont., on May 21, 1848. Prior to his connection with the city of Winnipeg, he had extended experience as engineer and contractor on the construction of the Intercolonial and Canadian Pacific Railways. City Engineer Ruttan has had a distinguished military career, having served in the Fenian Raids and Northwest Rebellion. He is the possessor of medals for his part in both of these expeditions. The Long Service Decoration has also been conferred upon him. He was a member of the first Council of the Canadian Society of Civil Engineers, and is a past-president of that body.

[illegible] in diameter by 18 ft. in height, and two of 1,000 [illegible] each [illegible] ft. in diameter by 18 ft. in height, with necessary platforms, hoppers and piping. This plant has an overload capacity of 50 per cent with selected coal, and readily makes gas from anthracite, lignite or any non-caking bituminous coal. The coal for use in the plant is delivered on track adjoining the building and is unloaded into a hopper having a capacity of one hundred tons.

General Statistics—Summary

	Constructed miles. 1912	Total miles. Dec. 31-12
Asphalt, No. 1 pavements	5.873	80.869
Asphalt macadam pavement	4.99	12.039
Cedar block pavement (.547 miles removed)	.722	26.519
Sandstone block pavement	.026	.026
Macadam pavement (.392 miles removed)	.44	33.791
Grading	1.546	249.340
Granolithic walks.	9.635	109.024
Plank walks (3.427 miles removed) ...	17.233	355.136
Sewers	12.68	216.148
Water mains, domestic	12.79	237.89
Water mains, high pressure (fire service waterworks)	1.09	9.14
	No.	No.
Fire hydrants, high pressure—(fire service waterworks)	14	100
Hydrants laid on new domestic mains ...	8-in.-12, 6-in.-134	
Hydrants laid on old domestic mains ...	8-in.-4, 6-in.-74	
	8-in.-16, 6-in.-208	1880

Appropriations for 1913

The following is a statement of appropriations for local improvements, 1913: asphalt pavements, $650,000; macadam pavements, $10,000; block pavements, $20,000; granolithic sidewalks, $100,000; plank sidewalks, $60,000; sewers, $331,504; water mains, services and meters, $425,000; streets and lanes, $100,000; boulevards, $10,000; sanitary improvements, $1,000; high pressure water mains, $125,000; total, $1,832,504.

1913 Municipal Programme at Kamloops, B.C.

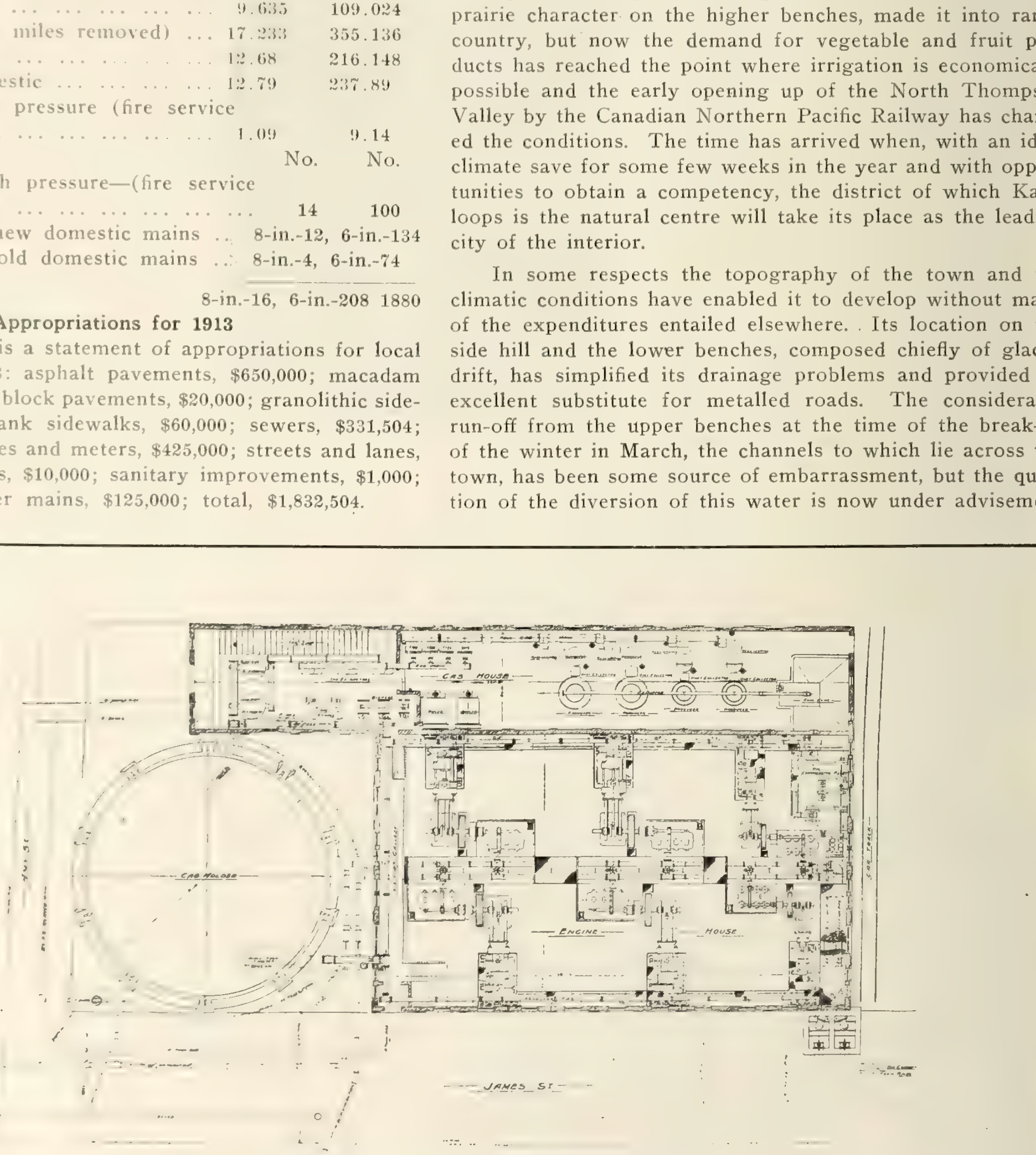
By John A. Wilson, City Engineer

In view of the fact that municipal expenditure in lines of public works is mainly dependent on industrial activity, few Canadian cities being in a position to develop themselves as residential towns, it is not out of place, perhaps, to refer to the conditions which have existed here in the past and make mention of those facts that will influence growth in the future.

Kamloops, situated at the junction of the North and South Thompson Rivers, some 250 miles from Vancouver, was a very important distributing point in the trading days, but competitive rates to the coast militated against a continuance of the situation. Now that a new route is shortly to be opened, however, its natural position will enable it to take its fair share of the business.

The range of temperatures and lack of facilities for disposing of other products, together with its characteristic prairie character on the higher benches, made it into range country, but now the demand for vegetable and fruit products has reached the point where irrigation is economically possible and the early opening up of the North Thompson Valley by the Canadian Northern Pacific Railway has changed the conditions. The time has arrived when, with an ideal climate save for some few weeks in the year and with opportunities to obtain a competency, the district of which Kamloops is the natural centre will take its place as the leading city of the interior.

In some respects the topography of the town and the climatic conditions have enabled it to develop without many of the expenditures entailed elsewhere. Its location on the side hill and the lower benches, composed chiefly of glacial drift, has simplified its drainage problems and provided an excellent substitute for metalled roads. The considerable run-off from the upper benches at the time of the break-up of the winter in March, the channels to which lie across the town, has been some source of embarrassment, but the question of the diversion of this water is now under advisement



Fire Service Waterworks—City of Winnipeg.

and it is probable that another year will see means being taken to pass it through the city under control.

Having regard to the support given to municipal expenditure in 1912, this year was looked forward to as being one in which improvements would be taken up actively, but the money situation which Kamloops—in company with many other places, finds itself, has brought about retrenchment, and at this writing the only work contemplated is the completion of the works which money by-laws were carried last year. Among these were, a park by-law for the purchase and development of the 11-acre Riverside Park, and a grading by-law to rough grade a roadway and sidewalk on twelve or fifteen blocks with tree planting on the boulevard area. Other work to be done as the season opens is the completion of the 1½ miles of cluster lighting system which was delayed last fall and the carrying through of the steam end of the new lighting and pumping station and connection of the same to the existing system.

Kamloops, which has always preserved the general character of a compact town, is already rather well served with water mains, and it is likely that no extensions will be made this year. The council, recognizing that the year is to be one of limited expenditure, has wisely turned its attention to an overhaul of its organization and purposes to bring several of its departments up to date during its release from more active matters.

Among other measures before it is the adoption of a grade by-law, establishing grades on six or seven miles of streets where improvements already exist and in the immediate neighbourhood of the same so that it will not suffer embarassment when the heavy grading, arising from the rough topography, will have to be done. Another matter that has made itself felt is the need for a more detailed account-keeping system in regard to both the cost of works and the making of rates for water and light service. It is hoped that this may be in working order towards the end of the year.

The rapid rise of real estate values since 1909 and the modern tendency to utilize to the utmost all space on the more important streets has raised the question of a revised sewerage system in the business parts of the town and it is probable that the existing service, designed more for residential use than for the accommodation of business premises, will come into practical politics during the year.

Proceeding along the lines of making provision for increased business facilities, it has been realized that vault and area leases are legitimate assistance to property and the early passage of a by-law to give effect to this use will doubtless promote development.

Public Works of Brockville, Ont.

By G. H. Bryson, Town Engineer

BROCKVILLE is recognized as one of the most progressive towns in the province of Ontario. It is one of the pioneers in municipal ownership and owns its water, gas and electric light plants. The town is now under contract with the Hydro-electric Commission of Ontario and expects to be furnished with power from this source early next autumn.

Last year an ambitious programme of street paving was commenced and about a mile of asphalt was laid on the chief thoroughfare. This season it is intended to pave an additional street area amounting to about 8,000 square yards, tenders for which will be called for at an early date.

In connection with the laying of the pavement last season, a system of underground conduits was installed and before the close of this year it is expected that the unsightly poles, a prominent feature on the principal streets of most towns, will have disappeared.

A comprehensive scheme of improved street lighting is also to be carried out within the next few months. About three-quarters of a mile, covering the business portion of King street, will be lighted with cluster lights. The arc lights on the residential streets will be abolished, and will be replaced by continuous lines of Tungsten lights, giving much better lighted streets. This system has already been introduced on one street and has met with the hearty approval of all citizens.

Another improvement contemplated is the opening of a new street across the northern side of the town. Surveys have been made and negotiations for the right-of-way are now in progress. The opening of this street will necessitate the construction of a large concrete bridge over the Back Creek.

All concrete sidewalks are now built by the town by day labor. There are already in existence over thirty miles of these sidewalks and there is enough work now laid out by the Board of works to keep gangs going until winter sets in again. The town owns its own quarry and crushing plant, which not only supplies all the stone necessary for concrete work and other street requirements, but also furnishes, at a fair margin of profit, all the crushed stone required for private work throughout the town.

Brockville has a very comprehensive system of sewerage, which, of course, is being extended from year to year, and as there is a good deal of rock trenching in connection with this work, the trenching operations, where the rock occurs, are carried on throughout the winter. The town owns the plant required for work of this kind.

In connection with the water department the installation of a 5,000,000 gallon turbine pump is in contemplation.

The town has a splendidly equipped fire brigade, and a contract has just been made with the Northern Electric Company for the installation of a new fire alarm telegraph system, with a three-circuit repeater, which will replace the system that has been in use for about twenty years past.

Foremost among the paint manufacturing concerns of the Dominion are the Ottawa Paint Works, of which Messrs. Jas. Young and Chas. Higgman are the proprietors. Operations were commenced in 1900 and the first year's output was $7,000. Now, the factory, with up-to-date facilities at 687 Wellington street, Ottawa, turns out $150,000 worth of paint yearly. Most of the company's business is done in Ontario and Quebec. Around Ottawa and Hull ninety per cent. of the dealers handle their "Lion" and "Peerless" brand paints. Their white lead also has a large sale. The proprietors of the Ottawa Paint Works recently incorporated the Ottawa Varnish Company, which is turning out a fine grade of varnish specialties and japans.

At the annual meeting of the National Brick Company of Laprairie, Limited, held in Montreal, it was reported that the gross profits were $396,731 and the net earnings $255,196. The new plant erected at Delson Junction was completed only in time to permit of its being in operation during the last seven months of the year. During that time the output of this plant totalled over thirty million bricks, and for the full year the Laprairie Brick Company turned out sixty-four million bricks, making a total of over ninety-four million bricks. Orders received already this year are far in advance of those on hand at the corresponding date of last year. The directors state that the company will be on a regular 5 per cent. basis from March 1st. The election of the board of directors resulted as follows: J. N. Greenshields, president; Hon. Robert Mackay, vice-president; James W. Pyke, Lt.-Col. E. W. Wilson, John McKergow, Paul Galibert, and William Lyall.

Engineering Work and Practice at Lethbridge, Alta.

By A. C. D. Blanchard, City Engineer

THE beginning of public improvements in this city was made in 1904 by the construction of a modern waterworks and sanitary sewer system, the waterworks replacing the old system of water delivery by carts. As constructed at that time, the water system included a total length of seven miles of distributing mains, a standpipe having an elevation of eighty feet, and a pumping station with a capacity of two million gallons a day. The sewer system consisted of five miles of mains, the outfall discharging directly into the river. Topographically, the city is located some 250 feet above the level of the Belly River, and all the water used in the city is pumped through a head of about 350 feet.

During the three years following 1905 little construction was carried out in the city improvement work. In 1908, however, a number of streets were graded and a few cement walks were constructed. The following year saw additional construction in the way of grading, sewer and water extensions, and other improvements, and the first attempt was made to construct boulevards or lawns between the curb and the street line in residential sections. Besides the seeding of these boulevards, about 5,000 trees were planted. All such improvements in the way of parks and boulevards are entirely artificial, as the city, in common with most other prairie towns, is naturally without the advantages of forest growth of any kind.

The city extended by leaps and bounds after the year 1909 and at the present time, with a population of fourteen thousand inhabitants, it covers an area of 6.3 miles and has carried out improvements to the value of over two and one-half million dollars, including twenty-five miles of water mains, thirty miles of sewers, thirty-three miles of graded streets, and forty miles of concrete sidewalks. There is also a street railway system consisting of eleven miles of single track. The greater part of this work has been carried out during the past two years.

Sewerage.—The system of sewerage as adopted for the city is a separate system, and the sanitary sewage of the city passes through a modern sewage disposal plant having a capacity of two million gallons daily. The sewage treatment, consisting of sedimentation, filtration and chlorination, is complete in removing not only unstable organic matter, but all disease germs.

Mr. A. C. D. Blanchard*

Storm Sewers.—Storm sewers are being installed, and are planned to be at least a year in advance of the street paving. In most cases it has been possible to grade the streets so that the surface drainage is accumulated at three or four depressions. An important work before the city at the present time is the building of storm trunk sewers to remove the water from these points.

Water Supply.—The water supply to the city is of excellent quality as regards freedom from contamination, but at certain periods in the spring and early summer the water is rendered impure by the taking up of considerable alluvial matter. These conditions are common to practically all of the towns situated in Alberta and Saskatchewan, which derive their water supply from rivers. At the present time the city is embarking upon the construction of a water purification plant to have an initial capacity of three million gallons per day. This filter plant will be equipped with the usual modern devices for efficient mechanical rapid sand filtration and will involve, in addition to the filter plant itself, the installing of low head pumps to raise the water from the river into the filters.

The city has also under way a scheme to give a better water pressure in the business and upper residential section of the city by dividing the system into two separate zones, the upper zone being supplied by booster pumps placed at the city level pumping the difference in head between the two systems.

Paving.—Permanent paving was first commenced in 1912, when about fifty thousand square yards were laid. This paving is all constructed on concrete base with surfacing of bitulithic and asphaltic concrete. At the same time the construction of the street railway was proceeded with. Where the residential streets are still unpaved, the edges of the roadway are protected by cement or wooden curbs, and the roadway is crowned and kept in repair with road graders and the ordinary split log drag. The dragging has been done principally with a twelve-ton road roller.

Parks and Boulevards.—The city maintains a large area of grass boulevards in practically all of the built-up section of the city. On account of the dryness of the climate, a sprinkling system had to be adopted to keep the grass in good condition. The system consists of one-inch galvanized piping, laid parallel with the street in the middle of the boulevards. Openings are drilled on two or three foot centres throughout the length, and the water when turned into the pipe, sprays in such manner as to cover practically all of the grass. These pipes are connected with the watermain on the street at intervals of 300 feet.

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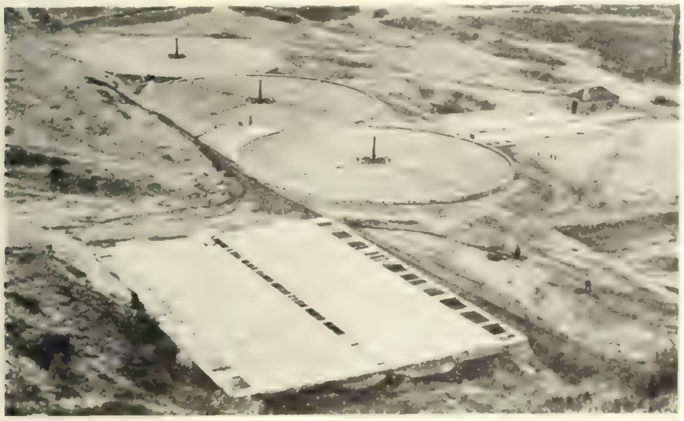
*__Mr. A. C. D. Blanchard,__ City Engineer of Lethbridge, Alta., is a native of Windsor, N.S. He was educated at the County Academy and afterwards at King's College and McGill University, obtaining the degree of Bachelor of Science, with honors. Upon leaving McGill, in 1901, Mr. Blanchard accepted a post with the American Bridge Company at Trenton, N.J., and in the same year went to Niagara Falls as assistant engineer on the construction of the 100,000 h.p. hydro-electric works of the Canadian Niagara Power Company. In 1906 he was resident engineer on the construction of the 30,000 h.p. hydro-electric plant of the West Kootenay Power & Light Company at Bonnington Falls, B.C., and in the following year was appointed assistant engineer on the staff of the City Engineer of Toronto, in charge of various works, particularly the design and construction of the main drainage system. He was appointed City Engineer of Lethbridge in 1911.

The parks of the city are commodious and well located. The largest, Henderson Park, has an area of some three hundred acres, of which one-third consists of a lake suitable for canoes and swimming. The lake (twenty feet deep) is fed by water from the irrigation system of the C. P. R., which passes within half a mile of the lake. The shores of the lake are protected with stone rip-rap and masonry walls, and the minimum depth of water at the edges is two feet. The park, while not well advanced in development, is laid out with narrow curved driveways, rustic bridges and ornamental shrubs and flowers. In its nursery in the park, the city has already planted about 30,000 small trees which form the supply for future use on the streets and throughout the parks in the city.

Coal Mine.—For the supply of coal which is used in the power plant and pumping station, the city operates a small coal mine. This mine is situated within a quarter of a mile of the plant, and the mine cars are drawn directly to the power house by a gravity tram line. The coal is of fair quality and the net cost of production is $1.45 per ton. This affords an excellent basis for obtaining cheap power for all municipal and industrial purposes. At the present time about thirty five tons a day is mined. The coal is not used for any other than municipal purposes.



Lethbridge sewage disposal works.

Staff.—The organization of the staff is similar to that prevailing in many other cities; two assistant engineers in charge respectively of water and sewerage, and streets and special work; superintendents, of each branch, and sub-foremen.

Utilities.—All the utilities, excepting natural gas, are municipally owned, and provide a yearly surplus from their operation.

Records.—Considerable attention has been paid to the developing of the cost keeping, accounting and estimating branch of the Engineering Department, and complete records of costs of work are properly kept, the advantage of so doing being obvious. The expense, after the system is in operation, is very small. The City Engineer bids on practically all of the work which does not require special plant to carry out, and the city is thus protected in obtaining reasonable prices from contractors. The Engineering Department also makes photographic records of work under construction at frequent intervals, for reference and record.

The City of St. Catharines, Ont., Entering upon a New Era of Activity

By W. P. Near, City Engineer

THE city of St. Catharines is enjoying a healthy boom, and the present indications point to a season of unparalleled activity in the constructional field. The writer was appointed City Engineer as recently as January 1, 1913, and so can give only a limited resume of the work already done, together with a brief description of the work planned for the present season. The municipal improvements already accomplished include 7 1/3 miles of pavements, 26 miles of sewers and 29½ miles of concrete sidewalks. This for a population of 15,000 may be considered a fairly well developed city. But during 1912 the improvements amounted to as much as any three previous years and those contemplated for 1913 will easily double those of 1912.

The laying of pavements and sidewalks and the building of sewers is done under the provisions of the Local Improvement Act entirely. So anxious are the property owners for all these improvements that although this year the first day of April was set for the last day to receive petitions for local improvements, 118 petitions have been received and recommended during those three months. These comprise the paving of 28 streets, the laying of 26 sewers and 64 pieces of sidewalk. The total value of local improvements in 1912 was $158,000, and the value of those already recommended for 1913 are pavements, $250,000; sewers, $50,000, and sidewalks, $20,000,—a total of $320,000.

Of the work begun last year, two items might be mentioned: the northeastern trunk sewer and the Ontario street high level bridge. The former is about two-thirds completed and represents an expenditure of $57,000. The Ontario street high level bridge is to be a $75,000 concrete structure built by day labor under the supervision of Mr. W. D. Scott, resident engineer.

Paving Work

The pavements already laid include bitulithic on concrete base, 3.4 miles; asphalt block, 2.3 miles; brick block, 1 mile, and Westrumite, ¼ mile, together with some water-bound macadam. The business section being pretty well paved with these more expensive pavements, some cheaper pavement is to be experimented with on residential streets this year. A three-inch wearing surface of Rocmac, and also of Tarvia, is to be laid on a 5-inch concrete base on several streets. This should save one-third the cost of the above mentioned pavements and give a pavement good for this class of street and one that is repaired easily without any extensive plant. Several contracts let last year for bitulithic pavements remain to be done and several other streets are recommended for this pavement for the coming season.

Contemplated and Under Way

In addition to the local improvements other works contemplated and in course of development by this office include the following:—

(1) A survey of the sewerage system of the whole city with regard to elevations, sizes of sewers and gauging of flows. Bench Mark plates are being located at convenient intervals throughout the entire city limits and accurate elevations are being obtained on these. This is being done to collect the necessary information for the design of collecting and relief sewers, which are becoming so necessary with the rapid growth of buildings and paved area and also for the construction of a sewage disposal system which the city may have to inaugurate in the near future. An adequate disposal system here will be a real problem owing to the general topography of the city, cut in sections as it is by the new Welland Canal, the old Welland Canal and Twelve Mile Creek, and also on account of the [illegible] ers constructed in former years with [illegible]

everywhere along the canal banks and into the hydraulic raceway.

(2) A complete system for filing and recording the history of local improvements and dates of expiry of guarantee periods.

(3) A revision of garbage regulations and the enforcement of an up-to-date set of rules for householders and garbage collectors. The garbage collection is done by contract.

(4) A more rigid inspection of private drain connections especially with regard to the tapping of sewers. A plumbing and drain inspector will probably be appointed this year.

(5) The requiring of new sub-divisions to comply with existing streets as regards widths and alignment. This city has suffered from this cause in the past and it adds immensely to the work of aligning sidewalks and pavements and designing sewers to have streets of all widths from 36 ft. to 70 ft. and at several angles as well as in square blocks.

(6) The re-naming of streets and revising the system of numbering lots in the whole city. About one hundred new names of streets have been added to the city's directory in one year and several streets have similar names. In other cases the same street has two names at different sections. Practically the entire city limits are sub-divided and are being built upon and numerous sub-divisions are now extending into the surrounding townships.

(7) A viaduct is being planned to bridge the ravine over the old Welland Canal to give a much needed western entrance to the city. A by-law to provide $250,000 for this purpose on what is known as the King street route was defeated on March 25th. The main objection was the excessive cost of the right-of-way. An alternative route eliminating this feature will be brought forward in the near future.

Real Boom at St. Catharines

Factories are extending their present buildings and new industries are coming. Among the latter may be noted the Goodrich Tire Company, from Akron, Ohio, who guarantee to spend $100,000 in wages the first year. It is a real problem to provide homes for these workmen and contractors are working to the limit. Some companies are even buying lots and erecting houses for their own mechanics. The attention of other large concerns is being drawn here by the cheap power and shipping facilities as well as by the climatic conditions and pleasant surroundings. Even the old settlers have caught the boom fever and the slogan everywhere is "Double the population in five years."

A building permit for the largest amount on a single document has been issued by the Montreal Council. This is for the new Protestant High School, University Street, the estimated cost being $1,760,000. Messrs. E. and W. S. Maxwell are the architects, the Geo. A. Fuller Company, Montreal, the contractors for the superstructure, and John Quinlan & Company the contractors for the foundation. The latter work has been in progress for several months. The building will be five storeys high, the exterior being of brick, with stone trimmings and terra cotta. In the basement, provision will be made for a shooting gallery for boys, gymnasiums for boys and girls, and a swimming tank. A large assembly hall is the feature of the ground floor. Class rooms will also be located here, and on the floors above. A library, teachers' rooms, museum, and dining and lunch rooms will also be provided, while on the third floor there will be a playing ground.

According to information from Quebec, operations will commence shortly on the alterations for the Chateau Frontenac. It is anticipated that the work will entail $2,500,000, but the extent has not yet been definitely settled owing to the absence of Sir Thomas Shaughnessy.

Canadian Railroad Development

According to a statement made by Sir William Mackenzie, in England, recently, the Canadian Northern Railway expects to build over six hundred miles of new track this year.

The Canadian Pacific Railway will begin construction work shortly on its proposed tunnel through Kicking Horse Pass in the Rocky Mountains. This tunnel will be about sixteen miles long and will cost about $14,000,000.

Three gangs of men are now at work on the Lake Erie and Northern Railway, and the company expect to have the entire line between Brantford and Galt, and Brantford and Port Dover, graded by about November 1st.

The Westinghouse, Church, Kerr Company, New York City, has been awarded the contract for making alterations to the terminals of the Canadian Pacific Railway at Winnipeg, the work including an extension to the Royal Alexandra hotel and an addition to the station. About $1,000,000 is to be expended.

It is stated that the survey of the proposed route of the Canadian Pacific Railway from Metaline, in the State of Washington, to Trail, B.C., has now been completed, and that the average grade will be one per cent. When completed, this line will be part of the new short line of the C. P. R., from Vancouver to Medicine Hat.

Plans were filed recently at Ottawa by the Canadian Pacific Railway for the tunnel which they will construct at Vancouver. The tunnel will have a total length of 3,800 feet. It will be laid with a single track, and will be 19 feet 6 inches in height and 16 feet in breadth. The average depth below the level of the road surface will be from 35 feet to 40 feet. The method of operating is not definitely decided upon, but it will probably be by electricity. The cost is estimated at about $1,000,000.

The High River and Hudson's Bay Railway Company, composed entirely of High River men, will apply at the next session of the legislature for amendments to their act of incorporation to provide for the increase of the capital stock to $1,000,000, to increase the bonds issued by the company from eighteen to thirty thousand dollars per mile, and to extend the time for the commencement of construction to five years from the date of the passing of the act. The act was passed at the last session of the legislature.

It is said that the Canadian Pacific Railway Company's yards at Transcona will be the largest in the world when completed. This year the company anticipate spending over $2,000,000. The scheme includes gravity distributing railway yards, to contain one hundred and five miles of track, large terminal elevators, together with round-houses, repair shops, and other requirements. The first development will amount to about sixty of the one hundred and five miles of trackage, necessitating in the neighborhood of 2,000,000 yards of grading.

Grand Trunk Pacific advices state that a contract has been let for the bridge construction on that line from Mile 1,094 to Mile 1,486 west of Winnipeg, at a cost of $2,000,000. This will include the following structures: McLellan Creek crossing, 249 feet; Little Shuswap crossing, 129 feet; Rau Shuswap crossing, 1,032 feet; Cottonwood Creek crossing, 129 feet; Fifty Mile River crossing, 129 feet; Second Fraser River crossing, 639 feet; Third Fraser River crossing, 968 feet; Willow River crossing, 459 feet; Fourth Fraser River crossing, 1,227 feet; Upper Nechaco River crossing, 642 feet; Bulkley River crossing, Mile 1,481, 154 feet; and Bulkley River crossing, Mile 1,486, 364 feet.

Sewerage and Other Work at New Westminster

FROM interesting details kindly furnished by the City Engineer, Mr. J .W. B. Blackman, we have prepared the following article detailing the work of the municipal engineering department at New Westminster. This embraces a description of the Sapperton sewerage scheme and particulars of street paving and other construction, with itemized costs for the year 1912.

City Engineer J. W. B. Blackman

Sapperton Sewerage No. 1.—Up to the time that this scheme was designed, the sewers in the city had been built upon the separate system, as it was expected that treatment would have to follow ultimately. In 1912, sanction was given by the Provincial Government to a proposal for combined storm and sanitary drainage for this area. It was pointed out that as the minimum flow of the Fraser was 130,000 cubic feet per second, the maximum being 490,000 cubic feet, a population of about 7,000,000 could drain into it safely without danger to health, and that the time of growth of this population would exceed the life of the proposed sewers.

The first question to be decided was the rate of rainfall. The only record of fall in short periods in British Columbia are those of the City's Automatic Recording Gauge, installed by Mr. J. W. B. Blackman, City Engineer, July, 1911. The maximum falls recorded in this time are as follows: 0.15 ins. in 5 min. equals 1.8 ins. per hour rate; 0.21 ins. in 10 min. equals 1.26 ins. 0.31 ins. in 60 min. equals 0.31 ins.; the mean yearly rainfall over thirty-one years being 58.65 ins.

Fig. 1 shows the rainfall intensity curve adopted, the dotted line representing the maximum intensities and the full line the adopted curve. It will be seen that intensities of over 26 ins. per hour have been neglected. It is considered that the heavier storms are local in their effect, and taking into consideration stock sizes of pipes and a minimum of 8 ins., the consideration of times under ten minutes would be carrying things to too great a depth of refinement.

The next point is the amount of run-off, the following standards being adopted: roofs, 100 per cent.; parks, 40 per cent.; gardens, 30 per cent.; roads, 63 per cent. This gives an average of 55 per cent. over the whole area, the sewerage being such a small percentage of the total to be provided for has been neglected in the design.

This area divides itself naturally into two distinct drainage sections, Nos. 1 and 2, their combined area being 1,594 acres. Section No. 1 has an area of 1,247 acres, the land rising from the river level to 400 feet above it at the limit of the area. The present surface drainage is by way of a stream known as Glen Brook, the last mile being through a valley about 50 feet deep, narrowing down in its lower part to a ravine. This section of the stream is in the Dominion Government Penitentiary property. After the construction of the sewer, the ravine is to be filled in. Of this area, 683 acres are in the municipality of Burnaby, and as this stream is their only outlet, an agreement has been come to, whereby both pay a share of the cost of the trunk sewers in Westminster used by both parties. This is advantageous to all concerned.

The Outfall

The outfall will extend to about 100 feet into the river and will be laid below the lowest low water-mark. It will consist of 84 in. reinforced concrete pipes of the lock jointed type, four outlets being provided in the inverts of the last lengths to diffuse the sewerage. Continuing up through the Penitentiary grounds the sewers will be of elliptical horse-shoe section (See Fig. 2). This section is reduced for 2,000 feet on the steep grade of 5.75 per cent. met with. The velocity will be extremely high, reaching, when the sewer runs full, 33 feet per second. To meet this it is proposed to line the invert with granite cobbles which abound in the district. These will be grouted in with cement mortar.

Eventually there will be about 50 feet of fill on this section. In the design a vertical pressure of 2,700 lbs. per sq. ft. and a horizontal pressure of 1,600 lbs. per sq. ft. have been allowed for. At the head of the ravine a sand catcher will be built, and from here branches will be carried into the municipality of Burnaby. The laterals will be laid in vitrified pipe up to 18 in. diameter, and from 20 in. upwards in reinforced concrete pipe, of lock joint type. These are laid at a sufficient depth to give a cellar drainage depth of 4 ft. at a distance of 100 feet back from the road. No disconnecting traps are used, the vent shaft on each house taking its share of the ventilation, the manhole covers being open. The street water is collected into catch basins of the usual type, with gratings in the street gutters.

The estimated cost for connections, laterals, mains, is

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*Mr. J. W. B. Blackman, City Engineer of New Westminster, B.C., was born in Kent, England, in 1878. His early professional training was received at the hands of Mr. G. F. Miller, M.I.M.E. Later, he took a course at the Brighton College of Engineering and Science, where subsequently he held a mastership. For six years he practised his profession in the city of Brighton, Sussex. During this period he was a frequent contributor to leading technical publications. After the early stages, Mr. Blackman devoted the greater part of his attention to the various phases of municipal engineering. Mr. Blackman has had valuable experience in the construction of sewage disposal works, modern systems of drain sewers and special adaptations of mechanical and scientific sanitation. He is a Member of the Canadian Society of Civil Engineers, a Professional Associate of the Surveyors' Institute (Eng.), and a Member of the Society of Architects of England. In 1907 he accepted an appointment as manager for Mr. J. H. Brownlee, C.E., of Vancouver, with whom he remained until March, 1909, when he went to New Westminster as City Engineer.

[illegible] per acre to New Westminster. The area is divided into six constructional districts, so that parts of the system may be laid as desired.

Section No. 2 is entirely within the city and has an area of 347 acres. The laterals are similar to those in No. 1 Section and terminate in a sand catcher from which the outfall is taken. This sand catcher will be divided into two compartments, for cleaning purposes, and a gauge weir will be placed in each with a self-recording apparatus, common to both. Valuable records with regard to run-offs are hoped to be obtained. From here the outfall is taken across the flats and under the Brunette River, a tributary of the Fraser, by syphon, in two 48 in. reinforced concrete pipes, the outfall being kept in duplicate for cleansing purposes, as trouble is often experienced with inverted sewage syphons. The outlets into the river will be formed of lengths of reinforced concrete pipe, with flange joints at each end, lowered from the surface and bolted together under water. Automatic flush parts and hand gates are provided where they are most likely to be required.

Section No. 2 is also subdivided into six constructional areas. The cost per acre for this section is $1,000, being greater than that of No. 1, as that area has large tracts of reserve land, and receives no government aid, the actual cost to the ratepayers for both sections being 23 cents per foot frontage per year for thirty years, the city as a whole paying its share for surface water from its streets in each sub-section. The total cost of both sections is $884,000, without laterals in Burnaby municipality.

Mr. A. O. Powell, M. Am. Soc. C.E., consulting engineer, was called into report on Section No. 1 at the request of Mr. J. W. B. Blackman, City Engineer, to assist him in deciding what amount of rainfall and run-off should be decided upon, as the records in the city, as mentioned before,

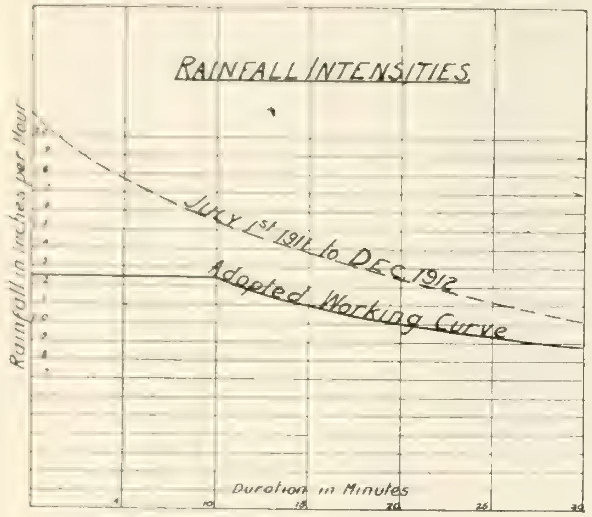

Fig. 1—Rainfall intensity curve.

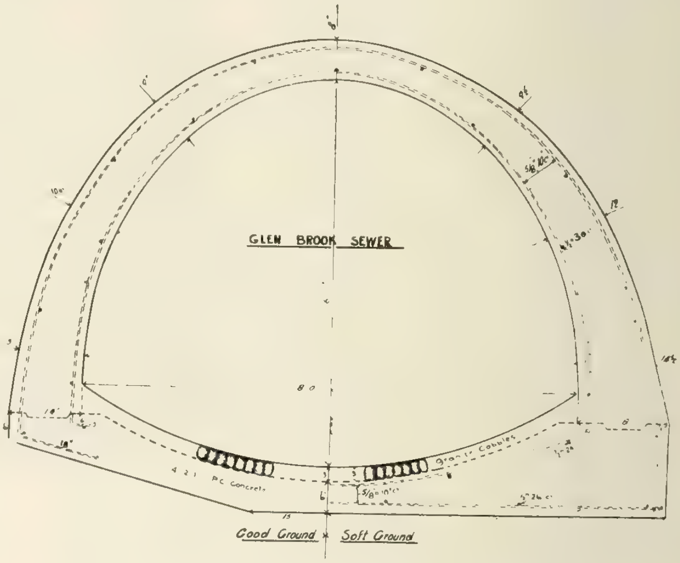

Fig. 2—Typical cross-section glen brook main sewer.

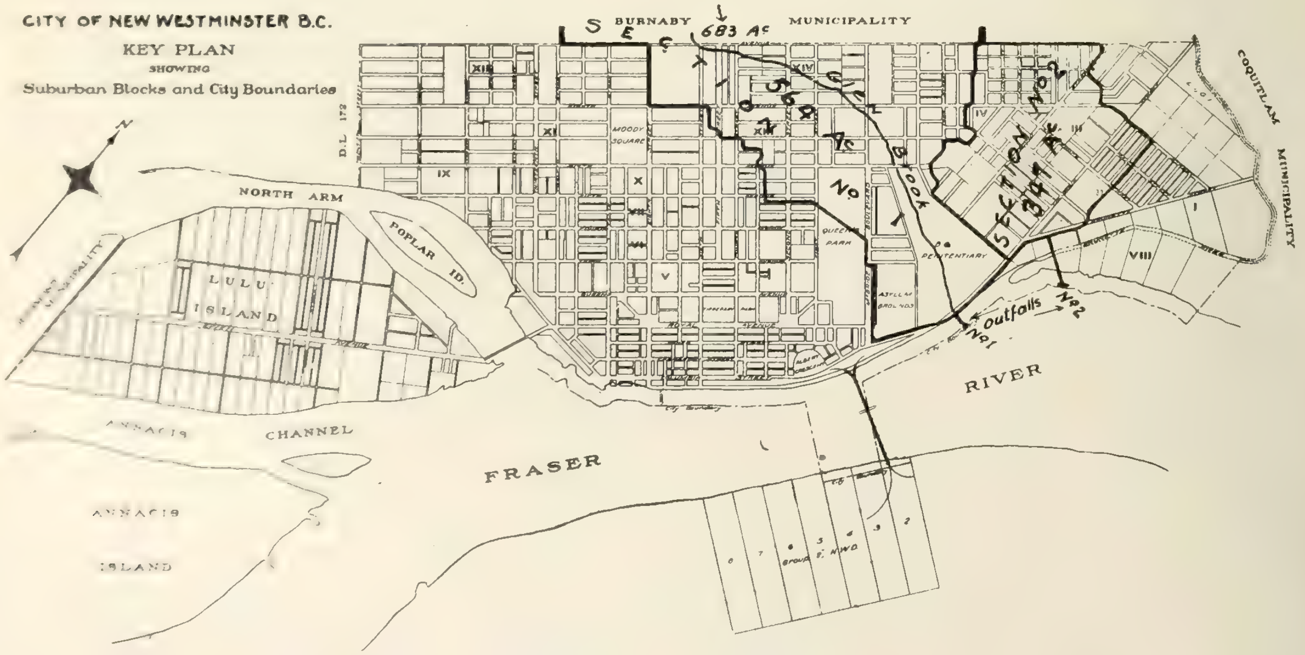

Fig. 3—Key plan of the city of New Westminster, showing Sapperton Sewer, Nos. 1 and 2 areas.

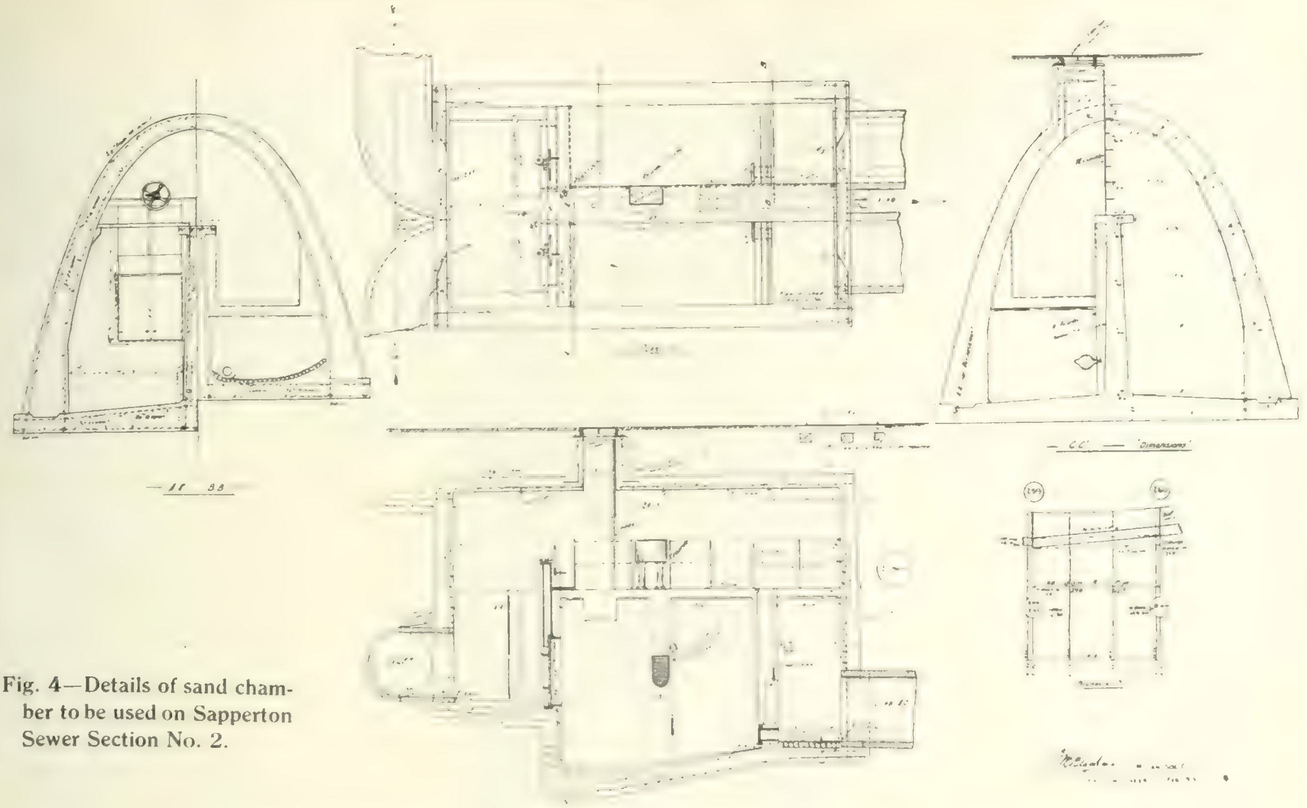

Fig. 4—Details of sand chamber to be used on Sapperton Sewer Section No. 2.

extended over such a short period. He advised a slightly greater percentage of run-off, and his rainfall curve gave somewhat higher results, but the increase in quantities given by him is practically balanced by stock sizes, and few alterations were required.

The two schemes, when completed, will add 45 miles to the present fifty miles of sewers laid within the city. Contracts awarded for Section No. 2, for Outfall and A. and B. Sections, amount to $210,000. The work is to be commenced immediately.

Board of Works Department

The work performed by day labor consists of the clearing, grading and macadamizing of streets, construction of timber sidewalks, crossings, etc., cleaning paved streets and installing house connections to sewers. During 1912, the following work was carried out:—grading, 15.76 miles; macadamizing, 13.26 miles; clearing, 9.38 miles; timber sidewalks, 12.96 miles; timber crossings, 2.35 miles—a total expenditure of $280,141, being made in this department.

Contract Work

The following schedule shows the amount of contract work carried out during the year:—

Front street paving, Hassam Paving Co.	$ 13,674
Twelfth street, Hassam Paving Company	84,776
Alexander street, T. R. Nickson & Co.	9,120
Sixth St. (Columbia to Front St.) Hassam Paving Company.	4,500
McKenzie Street (Columbia to Front Street) Hassam Paving Company	2,050
Begbie Street (Columbia to Front Street) Hassam Paving Company	1,749
First St., improvement, Col. Bitulithic Co.	41,444
Second St., improvement, Col. Bitulithic Co.	25,160
Third Ave., improvement, Col. Bitulithic Co. ...	16,861
Fourth St., improvement (Royal to Sixth)	2,500
Fourth Ave., improvement, Hassam Paving Co.	14,006
Fifth Ave., improvement, T. R. Nickson & Co.	16,310
West End sewer, T. F. Sinclair & Company	100,027
Storm sewers, T. R. Nickson & Powers	67,407
Garbage scow, Powers Contracting Company ...	3,250
Arena building, Powers Contracting Company ...	26,000
Isolation hospital, Hyslop & Lightbody	5,280
Garbage wharf, W. A. Gilley	2,195
Total	$436,309

Following are particulars of works carried out and in hand:—

Works carried out under contract during 1912..	$ 436,309
Surveys made, plans prepared and contracts let for street improvements	386,435
Surveys made and plans prepared for Sapperton sewer	884,110
Street improvement by-laws, 1911 and 1912 (estimate)	200,000
Surveys made and designs, plans and estimates for covered-in reservoir in Queens Park	58,500
Surveys made and designs, plans and estimates for raising level of the upper reservoir, Sapperton.	4,131
Surveys made and designs, plans and estimates for reinforced concrete bridge, Clarkson street.	14,824
Total	$1,984,309

Waterworks Department

Over eleven miles of new steel, iron and wood mains were laid and 466 house sewers put in. A new reinforced concrete service reservoir of 1½ million gallons, the first unit of the 5,000,000 gallon reservoir, was designed, and a scheme prepared for increasing the capacity of the existing high level service reservoir. Plans were also made for an additional main to Lulu Island of 20 in. diameter, 2.87 miles in length, including twin 16 in. flexible pipes under the north arm of the Fraser River.

Municipal Engineering in the Town of Oshawa, Ont.

By Frank Chappell, Town Engineer

A town some sixty-five years old with a population of over five thousand inhabitants and yet without a regular system of sewers or water supply! Such was the condition of the town of Oshawa as recently as 1905. About that time a waterworks plant was installed and a system of separate storm and sanitary sewers laid down on a moderate scale. The first engineering work was done under the direction of Mr. Willis Chipman, C.E., of Toronto, with the J. H. McKnight Construction Company, of Toronto, as contractors.

The system has since been rapidly extended until now there are nearly thirty miles of water mains and sewers. From 280 private connections with these mains and sewers in 1906 there are now 1,150. These are all laid by the town, by day labor.

Until about a year ago, cement sidewalks, sewers and water mains were all laid by day labor. With the great demand and the increasing difficulty of providing labor, however, it was found too cumbersome to keep up this method of work and so, first, the cement sidewalks were laid by contract. Then the excavation for sewers and watermains was let by contract, but the provision of the material and the laying and connecting of same has been kept in the hands of the town.

Mr. Frank Chappell

This combination method of contract and day labor, while being, in some cases, a little more expensive than day labor alone, has proven very satisfactory. The worry over dearth of labor and the trouble of a big pay-roll is eliminated, and yet the vital work is carried out carefully and systematically by the town. In 1910 the main sewer which emptied into an open creek was diverted from this outlet into a new sewer, and carried about a mile further to a site which had been purchased for sewage disposal works.

The following year, 1911, saw two sedimentation basins of the Lethbridge type, with screening chambers, etc., built here, each 50 ft. x 25 ft., with a total capacity of 100,000 gallons. These were according to the design of Mr. T. Aird Murray, C.E., and provision has been made for the addition of filters at some later date. The contractors for this work were Messrs. Murray & Spencer, of Niagara Falls, Ont., and it was carried out at a cost of $6,500.

Cement concrete sidewalks have been laid intermittently during the last fifteen years, and there are now over sixteen miles of such walk. The streets were not paved, but to a certain extent graded and gravelled. As may be imagined, such tearing up of streets that has taken place during the last seven or eight years has not been conducive to a smooth surface. However, progress has been made in that direction. In 1909, the first attempt at paving, or rather surfacing a road, was made. A strip of broken stone was laid on a Telford base and finished off with a concrete curb. There is no convenient stone quarry, however, so broken stone is expensive, and as, after all, this is not a permanent pavement, it is not likely that much more of this class of road will be constructed.

In 1911, however, further progress was made, and over 15,000 square yards of asphalt block was laid on a concrete base, around the business section of the town. This meant a reconstruction of the whole of the railway track on the streets paved. As the traffic is very heavy, eight inches of concrete was placed under the ties. In the more important part of the town the sidewalk had to be extended to the curb.

The telegraph, telephone, electric light and railway companies each had their own poles. These unsightly features had existed for years, but efforts were now made to unite as far as possible the parties interested, with the result that in one block alone, 700 feet long, where there were formerly 26 poles on one side of the street, there are now but eleven. The paving work was carried out by Bangham & Gale, of Windsor, Ont., and the total cost of the above mentioned work was under $43,000.

The year 1912 saw over 20,000 square yards more pavement laid, this time bitulithic on the sides, with brick in the track allowance. The work was in the hands of the Warren Bituminous Paving Company, of Toronto, and the cost with all alterations, storm sewer connections, etc., was $61,000. One good feature that is insisted upon in this class of work is that all houses, even vacant lots, shall receive sewer, water and all underground connections they may require before any pavement is laid. The chances, therefore, of tearing up of the surface are small.

This year a strong effort is being made to pave the main highways into the town. These are passing farm lands in outlying districts, but it means that Oshawa will be taking an interesting part in the construction of a small portion of a Toronto-to-Montreal highway without waiting for the government to move. The roads will be of concrete,

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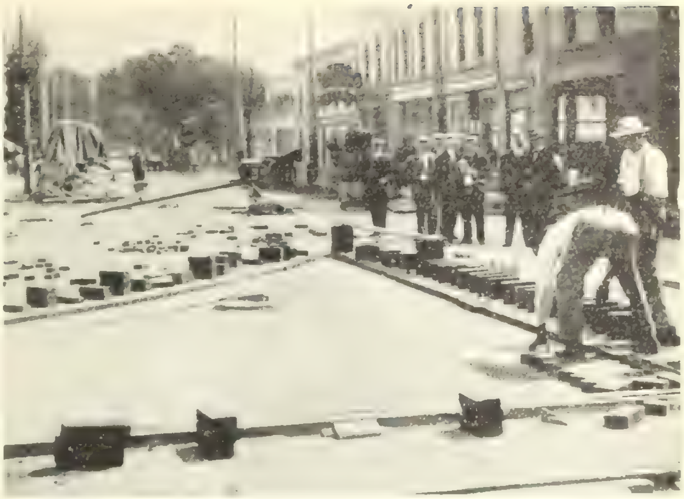
*Mr. Frank Chappell, Town Engineer of Oshawa, Ont., is a native of Cardiff, Wales. After completing a five years' apprenticeship course in the workshop and offices of the Mercantile Pontoon Company, ship-builders and repairers, of Cardiff, and winning a scholarship, he began a course of study in civil and municipal engineering at the University of South Wales, from which he graduated in 1907. Coming to Canada, he entered the employ of the Grand Trunk Railway Company at Montreal. In 1908 he attended McGill University, Department of Surveying, and later took up postgraduate work in municipal engineering at McGill. After completing this course he engaged in work in a private capacity until June, 1909, when he was appointed town engineer and superintendent of waterworks at Oshawa.

Street paving at Oshawa. Excavation in progress on one side, while track on the other side is receiving concrete base.



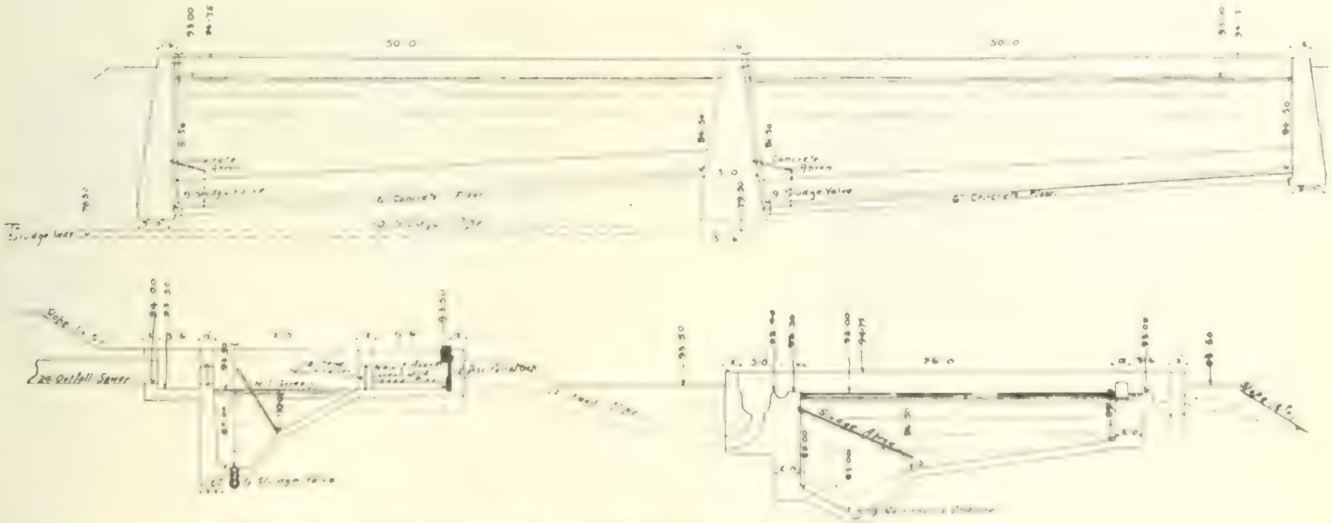
Asphalt block laying—showing herring-bone work at intersection and around track turn-out.

sixteen feet wide, with gravel or broken stone shoulders three to four feet wide on each side of the concrete.

The local improvement plan will be adopted and under this, with the property owners paying 60 per cent. and the town contributing the remaining 40 per cent., the cost is estimated at five cents per foot to the land owners on each side for twenty years, while the town's annual share for the same period will be $750. The total actual cash estimate for this work, which covers in all about two miles, is $20,000.

The waterworks is in the hands of a Commission and is a profitable undertaking. In 1912 the total cost of pumping 1,000 gallons, with a steam plant from Lake Ontario, four miles away, was less than 8.25 cents, this sum including depreciation charges and the annual amounts paid off for principal, interest, etc. The system is extensively metered and the per capita consumption per diem is 52.5 gallons. Of the possible number of consumers to be reached, 65 per cent. are already served. In the near future it is likely that a rapid filtration plant will be installed.

The C. P. R. is now cutting through the town and steel



Oshawa Sewage Disposal Plan of proposed screening chamber and sedimentation tanks.

Sedimentation basins complete except for sludge aprons and roof

Screening chambers in foreground and sedimentation basins complete except for housing and roofing.

laying for the Toronto Eastern radial road will be carried out this season, so that it is likely that the building trade will exceed all past figures. In 1912, the value of permits issued was considerably over $300,000. The population is now 8,500, and a sudden increase may be expected if the rumored annexation of Cedardale takes place.

Oshawa takes pride in the soundness of its various factories and institutions. There are several factories that are easily bigger than any of their competitors in the Dominion, and while the town has suddenly shot ahead the last four or five years, it has lasting powers behind it that assures its not outgrowing its strength.

Personal Mention

Mr. C. Brakenridge, Assistant City Engineer of Vancouver, was born at Whitehaven, Eng., in 1885. Upon the completion of his school course he was articled to the late J. S. Moffat, civil and architectural engineer and land surveyor. During 1905 and 1906 he was employed as contractors' resident engineer on the construction of the Oughterside Colliery Branch Railway in England. Following this he fulfilled the duties of assistant engineer for the Caledonian Railway at Glasgow, Scotland. Coming to Canada in 1907, he identified himself with the Grand Trunk Pacific Railway, commencing with them as draftsman at Edmonton and later at Skeena River. In 1908 and 1909 he was employed as draftsman and instrument man for the Yukon Gold Company at Dawson. For two years following he occupied the post of chief draftsman in the office of the city engineer of Vancouver. He has occupied his present position since 1911.

Mr. C. Brakenridge, Assistant City Engineer of Vancouver.

Mr. T. Aird Murray, of Toronto, has left that city for Fort William and Abertan points.

Mr. C. J. Yorath, of London, Eng., has been appointed City Commissioner of Saskatoon, Sask., at a salary of $5,000.

Mr. E. B. Wingate, C.E., died recently at Hamilton, Ont. For some years Mr. Wingate held the position of City Engineer of Hamilton but had been in private practice of late.

Mr. Chas. E. Fraser, of the firm of Fraser Brace & Co., New York, the successful tenderers for the $3,000,000 contract for the development of the Cedars Rapids (as announced in our issue of April 23) is a graduate of McGill University, class '99.

Mr. Geo. T. Clark, Saskatoon, Sask., has recalled his resignation and will remain in the capacity of city engineer there.

Mr. H. R. Scott, manager of the Builders' Supply Company, of Winnipeg, returned recently from a trip of two months' duration in Florida.

Mr. James Eadie, Montreal, has been appointed clerk of the works on the new Central Technical School, Toronto. Mr. Eadie is a graduate of Glasgow University and a civil engineer.

Mr. J. G. Milne, formerly of the Works Department at Toronto, has entered business for himself. He has been awarded a $50,000 contract for the installation of a waterworks system at Brighton, Ont.

Albert G. MacFarlane, District Engineer of the National Transcontinental Railway of Canada, died recently at Ottawa, Ont. He was 52 years old and was formerly with the engineering department of the Canadian Northern Railway.

Mr. Wilfred Skaife, Montreal, a member of the Canadian Society of Civil Engineers, died recently at his residence, Trafalgar Square. He was connected with the beet sugar industry and planned and erected several factories in Cuba for Sir William Van Horne.

Constructional News

A new church, estimated to cost $100,000, is to be built by the members of the Howard Park Methodist Church, Toronto.

Mr. Willis Chipman, Toronto, who recently reported on a storm sewer system for London, Ont., estimates the cost of the undertaking at $392,000.

The city council of Toronto have recently decided to call for tenders for the construction of the Bloor street viaduct in both concrete and steel.

Work has been started on the building of the floating drydock at Toronto. The total length is to be 330 feet, the width 100 feet and the lifting capacity 5,400 tons.

By-laws amounting to about $650,000 will be voted on by the ratepayers of Saskatoon on May 16th. The largest item in the above figure is $185,000 for a municipal hospital.

On May 15, the citizens of Medicine Hat, Alta., will vote on money by-laws aggregating $500,000. These by-laws include amounts for water and gas extensions and the laying of curbs and gutters.

Mr. T. Aird Murray, Toronto, who was engaged by the city of Peterborough as consulting engineer to advise on a sewage disposal plant, has recommended a plant to cost in the neighbourhood of $60,000.

Last summer the Montreal Council experimented with Tarvia B and Glutin to prevent dust on macadamised roads, and it has now been decided to utilize dust-laying preparations during the present season. Sprinkling the streets with water has been found ineffective, the water drying up within an hour.

Mr. Hazen, Minister of Marine, has intrduced a resolution to provide for $3,500,000 advance to the Quebec Harbor Commissioners, for equipping the harbor. The following estimates for the year were presented, although the entire work cannot be completed during 1913:—New quay wall to north face of Louise Embankment, $810,000; dredging of the trench for same, $110,250; dredging of channel approach, $621,250; filling required, $85,067; proposed grain elevator, $1,014,483; car ferry terminals, $56,350; railway tracks to elevator and terminal yards, $16,454; roadway bridge, $25,000;

floating cranes, $60,000; service boat, $130,000; floating tenders, $4,000; one-half of $900,000, dredging plant, $450,000; and building plant, $50,450.

The American Steel & Wire Company, 72 West Adams street, Chicago, have favored the Contract Record with a most useful desk calendar. There is a plainly lettered leaflet for every day of the month and an enumeration of the company's many lines.

The International Engineering Works, Limited, which is the successor of the Robb Engineering Company, under a reorganization scheme, have elected Mr. C. H. Cahan, K.C., president; Mr. H. A. Lovett, vice-president; Messrs. R. Brutinel, R. Garrett, D. W. R. Robb, and C. H. Cahan, Jr., directors. Mr. R. Garrett is general manager; Mr. D. W. Robb, sales manager; Mr. G. F. Gyles, treasurer, and Mr. G. W. Cole, assistant to general manager. The company have works at Amherst, N.B., and at South Framingham, Mass.

TUEC Stationary Air Cleaning System

THE United Electric Company of Canton, Ohio, will manufacture the Tuec line of stationary air (vacuum) cleaners in their new factory, B. O. T. Building, 159-61 Richmond street west, Toronto, Ont., commencing May 7th, 1913.

This company has had great success with their product in Canada, having received orders to equip some of the most notable homes and buildings in the Dominion. Hereafter, the complete line of cleaners, consisting of thirteen sizes and two hundred and sixty-four styles, will be made at the above location.

Toronto residence in which the Tuec stationary air cleaning system is installed.

The United Electric Company has now over 4,500 stationary installations. They claim to be selling two machines to one specification of "80 cubic feet of air per minute at 1 inch vacuum at the tool," is widely used by architects and engineers. Their system is based on the successful practice of the wood-mill engineers, viz., large conductors carrying a big volume of air.

The Tuec machines are models of simplicity and workmanship, and as there only two bearings in the direct-connected units, both of them ball, the friction loss is exceptionally low. It is claimed that they can be run for a life time without any appreciable wear on any bearing surface. The unsanitary cloth sack has been eliminated, so that the air supply, and therefore the cleaning efficiency is uniform at all times and there is no sack requiring cleaning at the end of each run.

There are five district offices to cover the Canadian field. These are located at Montreal, Toronto, Winnipeg, Calgary and Vancouver.

The Scherzer Rolling Lift Bridge Company, of Chicago

It is nearly twenty years since the first bridge of the Scherzer Rolling Lift type was constructed at Chicago. This is a four-track, elevated railroad bridge, which has been in successful use ever since, accommodating more than one thousand five hundred trains daily. This bridge being so satisfactory, has been the basis from which The Scherzer Rolling Lift Bridge Company have extended their business throughout the United States and many foreign countries, so that today more than two hundred of the Scherzer type have been constructed and placed under construction. The Scherzer Company have been very successful in England, through association with the late Sir Benjamin Baker, the eminent engineer of the great Forth bridge, and through co-operation with many of the leading consulting engineers in England, including Messrs. Livesey, Son & Henderson; Rendel & Robertson; Sir John Purser Griffith; Mr. Robert White; S. Pearson & Sons; J. B. Ball and others.

Bascule bridges may be divided into two classes: those that operate on a trunnion or pivot and those that roll on a track. The Tower bridge is of the former type. The Scherzer bridge employs the rolling principle, which has many advantages in reducing friction, simplicity, and rolling away from the channel when opened—all tending to greater economy: This explains the extensive adoption of the company's bridge in Great Britain, although the Tower bridge of the trunnion type is not patented. The Scherzer Rolling Lift Bridge Company have furnished the Canadian Northern Railway with several bridges and also the Canadian Pacific with a bridge now under construction across the McKellar River at Fort William. Some years ago a small bridge of this type was completed across a branch of the Welland Canal for the Dominion Government.

The company do not manufacture their bridges. Their practice is to furnish the designs and act as consulting engineers in co-operation with the government, railroad or local engineers. Designs are being submitted to the manufacturers of Canada for tenders and manufacture. In this way the Scherzer Company do not become competitors but develop new fields of work.

Dominion Paint Works, Limited

Among the new and interesting industries established in Canada during 1912 is the Dominion Paint Works, Limited, of Walkerville, Ont. This company's plant is unique among Canadian paint factories, in that it is electrically driven throughout. Buildings and machinery of the most modern type are used.

The Dominion Paint Works, Limited, has acquired the right to manufacture in Canada, under the original formulae all the standard and special paints which for 25 years have been made in the United States by the Detroit Graphite Company. For many years the Detroit Graphite Company has made a specialty of paints for the protection of structural steel, bridges, water power equipment, etc., and to meet severe conditions of all kinds, and its products are well and favorably known to a majority of the leading engineers and architects on both sides of the border.

The Dominion Paint Works, Limited, has in charge of its manufacturing operations men who have for many years been connected with the Detroit Graphite Company, and its products are identical with those turned out by the original makers. The company is prepared to manufacture coatings specially adapted to all classes of work and to give full information regarding paints best suited to different surfaces upon request. The company has sales offices in Montreal, Toronto, Winnipeg and Vancouver.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Bowmanville, Ont.

Town wishes to purchase all pumping machinery in connection with pump house, also a 100 h.p. a.c. motor to operate same. Specifications, at office of Engineers, Chipman & Power, Mail Bldg., Toronto. Clerk, John Lyle.

Berlin, Ont.

Sidewalks planned by city council. Mayor, W. D. Euler. Clerk, A. H. Miller. Asphalt or bitulithic pavements on King from Wellington to Waterloo boundary, Weber from Queen to Water street, Water from King street to Weber.

Brandon, Man.

City contemplates constructing 44,155 ft. of sewers at an estimated cost of $104,155. Clerk, Harry Brown. Engineer, R. E. Speakman.

Hamilton, Ont.

Sewage disposal plant, west end. Tenders received by Mayor, Jno. Allan, up to May 6th, for reinforced concrete sewage plant. Plans, etc., from City Engineer, A. F. Macallum, on receipt of $10 to be refunded on return of plans, etc.

Kingston, Ont.

Tenders will be received by Engineer, R. J. McClelland, up to May 5th, for 6,630 sq. yards street pavement, 2,150 lin. ft. concrete curb and gutter, and 1,500 lin. ft. concrete gutter.

Montreal, Que.

Purifying sewage plant planned. Secretary, L. N. Senecal. Engineer, Geo. Janin; City Hall. City Commissioners have decided to purchase land on the Back River for the erection of a plant.

Ottawa, Ont.

Paving, cost $75,000, contemplated by the Town of Eastview. Mayor, Mr. Gladun, McArthur Road. By-law will be submitted.

Port Arthur, Ont.

Waterworks system. Commissioner of Utilities, J. J. Hackney; City Engineer, L. M. Jones; Consulting Engineer, T. Aird Murray, 303 Lumsden Bldg., Toronto. Tenders received by Commissioner up to May 12th for construction of sections 1-10 inclusive of the new force main. Work includes trenching, laying approximately 6,000 ft. 12-in. steel pipe, 40,000 ft. 24-in. pipe, 2,500 ft. duplicate 24-in. intake in Lake Superior. Material supplied by Corporation. Plans at offices of city engineer and consulting engineer.

Regina, Sask.

Tenders received by City Commissioners till May 15th, for 1-pair vertical feed pumps, capacity 7,500 gallons per hour. One combined open heater and meter, 125,000 lbs. feed water per hour. Specifications, at office of Supt. Light and Power, E. W. Bull.

Water mains planned. Supt. of waterworks, J. M. Mackay. Specification at office of Engineer. Tenders received by City Commissioners till May 12th.

St. Thomas, Ont.

Brick pavement planned for Malakoff street. Mayor, E. N. Price. Council will secure information regarding various kinds of brick.

Waterloo, Ont.

Clerk, Jas. C. Haight has been authorized to call for tenders for a bitulithic pavement on Albert street, and tarvia pavement on William street.

Wingham, Ont.

Sewers, Victoria and Shuter, planned by town council. Mayor, Mr. Vanstone. Clerk, J. F. Groves. Tenders will be called for shortly.

Winnipeg, Man.

Sewers in Pacific avenue from Quelch street to road allowance. Worth street from Elgin to William avenue. Specifications, etc., at office of Engineer. Tenders received by Secretary, M. Peterson, until May 2nd, 1913. Engineer, H. N. Ruttan, 223 James avenue.

Sewers for Rural Municipality of Assiniboia. Sec.-Treas., Frank Ness, Kirkfield Park P. O. Engineer Rodgers, St. Charles, Man. For construction of sewer on Ferry Road from Assiniboine River to Ness Ave. and a submain on Ness Ave. from Ferry Road to East side of lot 41 St. James. Plans, specifications, etc., at office of engineer.

Woodstock, Ont.

Concrete walks planned by the city council. City engineer, F. J. Ure. Tenders received by Clerk, Jno. Morris, until May 2nd.

CONTRACTS AWARDED

Berlin, Ont.

Sewer pipe, castings, etc. Mayor, W. D. Euler. Clerk, A. H. Miller. Sewer pipe, R. Boehmer & Co., 76 King street east. Sewer manhole castings, Forwell Foundry Co., Ltd., 225 Queen street south. Cement tile, Paul Bergmann, Elgin and King streets, Waterloo.

Bowmanville, Ont.

Sewerage system. Clerk, John Lyle. Engineers, Chipman and Power, Mail Building, Toronto. General contractor, Mr. Connolly. Contract includes laying all sewer pipes in town and providing cement for same, also pipes.

Waterworks. Clerk, John Lyle. Engineers, Chipman and Power, Mail Building, Toronto. General contractor, Mr. Connolly. Contract includes laying all water pipes in town and providing material for same, construction of a pump house and 3 concrete reservoirs, laying gravity main from Skinner's Springs to town. Pump house 24 x 12 x 14, concrete foundation, floor and roof, pressed brick walls, cast iron pipe, special fittings, valves, hydrants.

Hull, Que.

Sewers, Clotilda street, planned. Mayor Dupuis. City Engineer, J. P. A. Laforest. General contractors, Kilson & Couture.

Laval Des Rapides, Que.

Waterworks, cost $91,000, planned by Municipal Council. Clerk, Louis Senez. Engineers, Ouimet, Lesage & Desrochers, 15 Blvd. St. Lawrence, Montreal. General contractor, A. Bray, 297 Delinelle street, Montreal.

Truro, N.S.

Paving, cost $8,000, Young. Engineer, C. McDowell, Town Hall. Town is doing work by day labor.

Welland, Ont.

Grading (to Smithville) planned by Toronto, Hamilton & Buffalo Railway. Chief engineer, R. L. Latham, James St. Station, Hamilton. General contractor, J. L. Boyd, 84 Victoria street, Toronto. 16½ miles track.

Railroads, Bridges and Wharves

Appleby, Ont. (Halton Co.)

G. T. R. Company will lay 1,000 ft. track for sidings for the Excelsior Brick Company.

Beachburg, Ont.

C. N. O. Rly. Co.'s location of station on Lot No. 7 at Beachburg, Twp. Westmeath, has been approved.

Belleville, Ont.

Wharf and dredging. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until May 20th. Plans, specifications, etc., at office of J. G. Sing, Dist. Engr., Confederation Life Building, Toronto; J. L. Michaud, Dist. Engr., Post Office Building, Montreal; Postmaster, Belleville, and at Dept., Ottawa.

Province of British Columbia

Branch railway. G. T. P. Rly. Co.'s location of Prince Rupert westerly line mileage 0 to 2.25 has been approved.

Burford Twp., Ont.

Bridge contemplated by the Twp. Council. Reeve, F. W. Taylor, Cathcart, Ont. Engineer-in-charge, Mr. Jackson, Brantford. One span, 70 x 14, cement substructure, steel superstructure.

Chamcook Harbor, N.B.

Tenders received by A. Johnston, Deputy Minister of Marine and Fisheries, until May 12th, for construction of a wooden lighthouse tower and concrete base, at Chamcook Harbor, Minister Island, Charlotte County, N.B. Plans, etc., at this Dept. at Ottawa and St. John, and Post Office, at St. Andrews, St. Stephen and Lepreau.

Dundas, Ont.

Extension of railway yards and tracks, cost $30,000, planned by Grand Trunk Railway, in the interests of the Crushed Stone Company.

Twp. Etobicoke, Ont.

Toronto Suburban Railway Company's plans of proposed undercrossing of C. P. R. at Mimico River in Lot 8, Con. B, Twp. Etobicoke, County of York, has been approved.

Edmonton, Alta.

C. P. R. Co.'s location of temporary station on Hardisty avenue, west of 9th street, has been approved.

Geikie, Alta.

G. T. P. Rly. Co.'s location of station at Geikie, in Sec. 8-45-2 W-6-M, at mileage 1035.1 west of Winnipeg, Dist. of North Alberta, has been approved.

Huxley, Alta.

G. T. P. Branch Lines Co.'s location of station at Huxley, has been approved.

Lachine, Que.

G. T. Rly. Co. has been authorized to construct two sidings for the Asbestos Manufacturing Company.

Province of Manitoba

Branch railway. C. P. R. Co. has been authorized to construct Bergen Northeasterly Branch from mileage 0.71 to 5.85.

Twp. Murray, Ont.

Bridge. C. L. O. & W. Rly. (G. T. R.) Cos. have been directed to carry highway over G. T. R. between Lots 8 and 9, Con. 1, Twp. Murray, Co. Northumberland, Ont.

Ottawa, Ont.

Tenders will be received by Secretary, P. E. Ryan, Commissioners of Transcontinental Rly., up to 12 o'clock noon May 1st, for erection of station and other buildings, Sec. No. 19, from mile 57 to mile 105.5 west of Weymentachene, in Prov. of Que.; Section No. 20, from mile 116.5 to mile 159.5 west of Weymontachene, in Pro. of Que.; Sec. No. 21, from mile 166 to mile 214.8, west of Weymontachene, in Prov. of Que.; Sec. No. 22, from Cochrane 150 miles eastward in the Provinces of Quebec and Ontario. Plans and specifications, at office of Mr. Gordon Grant, Chief Engineer, Ottawa, and at following Dist. Offices; for Sec. No. 19 and 20, Mr. A. E. Doucet, Dist. Engr., Quebec, Que.; for Sec. Nos. 21 and 22, Mr. T. S. Armstrong, Dist. Engr., Cochrane, Ont.

Owen Sound, Ont.

C. P. R. Co. has been authorized to construct 2 sidings for H. B. Harrison, across Lots Nos. 9, 8, 7, 6, 5 and 4, Range 6, Twp. Sydenham and Lot

Twp. Pentland, Ont.

C. N. O. Rly. Co. has been authorized to construct bridge aver Mink Creek, in Twp. Pentland, at mileage 185.22 from Ottawa.

Ruby Creek Station, B.C.

C. P. Rly. Co. has been authorized to construct bridge No. [illegible] over [illegible] Creek, near Ruby Creek Station on Cascade Sub-division, B.C., also bridge No. 791 on Cascade Sub-division.

Province of Saskatchewan

C. N. R. Co.'s location of railway through Twps. 24-22, Range 4-2 W-3-M Sask., mileage 80.09 to 99.72, has been approved.

Stettler, Alta.

C. P. Rly. Co. has been authorized to construct spur for the Imperial Oil Co., Ltd.

Tillsonburg, Ont.

Reeve Denton and Councillor McIntyre will secure estimates on a new steel bridge to replace wooden one swept away in recent floods. Clerk, A. E. Raynes.

Toronto, Ont.

Spur. G. T. Rly. Co. has been authorized to construct spur into premises of Telfer Bros.

Trenton, Ont.

C. L. O. & W. Rly. (C. P. R.) Co.'s location of station and grounds at Trenton, have been approved.

Winnipeg, Man.

Subway, cost $430,000, Princess St., contemplated by the Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James avenue. By-law will be submitted to ratepayers on May 1st, 1913.

CONTRACTS AWARDED

Kenora, Ont.

Six-stall addition to roundhouse, cost $30,000, for C. P. R. Work is being done by company.

Prince Rupert, B.C.

Wharf, cost $3,000,000, for G. T. P. Rly. Co. Contract for structural steel and reinforcing steel was awarded to the United States Steel Products Co., 30 Church street, New York, N.Y.

Sault Ste. Marie, Ont.

Dock, coal sheds and storage, cost $10,000. Sault Coal & Wood Co. require prices on sewer pipes, brick, cement and builders' supplies generally. 250 x 200. Work is being done by owners.

Twp. of Yarmouth, Ont.

Bridge, steel and cement construction. Reeve, Mr. Anderson, St. Thomas P.O. Steel work, Petrolia Bridge Co., Petrolia, $3,500. Cement work, Jos. Vincent, Yarmouth, $1,760.

Public Buildings, Churches, Schools, etc.

Barrie, Ont.

Addition and alterations to Collegiate Institute. Architects, Stewart & Witton, 2 Hughson street south, Hamilton. Tenders received by Sec.-Treas., Fred Marr, until May 15, 1913. Plans and specifications at office of architects and secretary-treasurer.

Brockville, Ont.

Moving picture theatre, King and Home streets, for John M. McLennan, Prop. Brock Theatre. Plans in progress.

Edmonton, Alta.

Addition to McDougall Church, cost $50,000, 2nd street. Pastor, J. E. Hughson. Architect, E. W. Morehouse, 27-28 Jackson Block. Red pressed brick construction. Building will contain gymnasium and swimming pool. Plans prepared.

Macleod, Alta.

Addition to school, 19th street. Sec.-treas., E. F. Brown. Architect, Mr. Widdington, Lethbridge. Brick construction, cement foundation. Plans in progress.

Montreal, Que.

Alterations to central post office fittings. Tenders received by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, until May 5th. Alterations and additions to fittings for money order, registration and customs parcel office fittings. Plans, specifications, etc., at office of architect, R. L. Deschamps, overseer Montreal Central Post Office and at Department, Ottawa.

New Westminster, B.C.

Addition to land registry office, cost $30,000, contemplated by Prov. Govt. Dept. of Public Works. Architects, Gardiner & Mercer, Westminster Trust Building. Three storeys, 46 x 43, reinforced concrete and brick construction. Plans in progress.

Niagara Falls, Ont.

School, cost $20,000, Oak street. Architect, C. M. Borter, Main street. Two storeys, 40 x 80, brick construction, stone foundation. Tenders received by Secretary, Geo. Mortimer, until May 1st.

North Bend, B.C.

Jail building and police station. Plans, specifications, etc., at office of H. P. Christie, Govt. Agent, Ashcroft, B.C., Prov. Constable, North Bend and Dept., Victoria. Tenders received by Minister, Hon. Thos. Taylor, Victoria, Prov. Govt. Dept. of Public Works, till May 10th.

Oakwood, Ont.

School, planned by Trustees Mariposa School Board. Secretary, E. G. Lytle, Oakwood. Architect and general contractor, Wm. B. Taylor, Allandale. Work to start at once. Brick construction.

Oshawa, Ont.

School contemplated by the R. C. School Commissioners. Priest, Rev. Father Cline. Plans will be prepared.

Ottawa, Ont.

Hall, etc., cost $10,000, LeBreton, planned by W. C. T. U. (Francis Willard Union) per Secretary at Ottawa. Site has been purchased.

Church, cost $25,000, contemplated for Greek Orthodox Catholics. Rev. Marcarcus Affendick. Site not purchased yet, funds being raised. Solid brick construction, with stone facings, concrete and stone foundation.

Customs Bldg., MacKenzie Avenue. Dom. Govt., Dept. of Public Works. Tenders will be received by Secretary, R. C. Desrochers, Ottawa, until May 21, 1913. Plans, specifications, etc., at office of R. L. Deschamps, 103 St. Francois Xavier street, Montreal. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, and at Department, Ottawa. Specifications also at office of MacLean Daily Reports, Toronto. Extended time.

Four room addition to St. Marys school, planned by Separate School Board. Chairman, Mr. Genest.

Ladies college, cost $130,000, Lyon St. Ottawa Ladies College, Albert street. Architects, Keefer, Richards & Abra, 229 Sparks street. Mason, Jno. Robertson & Son. Carpenter, [illegible] & Co., [illegible] Lewis.

Quebec, Que.

School, contemplated by R. C. School

[illegible] St. Sauveur. Architect, [illegible] Lemay, [illegible] d'Aiguilon, is preparing plans.

Forestry school, cost $60,000, planned by Trustees of Laval University. Chancellor, Most Rev. L. N. Begin. Architect, G. Emile Tanguay, D'Aiguilon St. Five storeys, 100 x 55.

Rodney, Ont.
Addition to school. Tenders received by architect, T. C. Campbell, until May 3rd. Two storeys, stone foundation, white brick construction.

St. Mary, Ont.
Exhibition buildings, etc., contemplated by Town Council and South Perth Agricultural Society. Town clerk, Thos. M. Clark.

Scarboro, Ont.
School, cost $7,000, Sec. No. 9, planned by Trustee Board. Tenders received by Architects, Monroe & Mead, Chancery Chambers, Hamilton. One storey, 80 x 40, cement foundation, stone,and pressed brick construction.

South Edmonton, Alta.
Additions planned by The Alberta Methodist Theological College and the Robertson Presbyterian College. The two colleges have decided to co-operate and build temporary building adjoining the Robertson College. Committee authorized to go ahead with work—R. B. Douglas, A. H. Calder, A. Davies, Whyte avenue, Prof. J. M. Millar, all of South Edmonton.

Toronto, Ont.
Theatre, cost $6,000, Parliament, for H. Peters, 88 Front street east. Architect, H. G. Salisbury, Room 12, No. 10 Adelaide east. One storey, 25 x 120, structural steel and brick conctruction, brick foundation. Plans drawn.

Customs House, Front street, contemplated. Dom. Govt. Dept. of Public Works has filed notice for expropriation of necessary land. Structural steel, stone and brick construction, stone foundation. Secretary, R. C. Desrochers, Ottawa.

Church (Independent) cost $10,000, McIntyre and Broadview). Architect, A. W. Hughes, 10 Adelaide east. Tenders now being received by J. Hebden, 2 Pine Crescent. Two storeys, 30 x 100, brick foundation, stone and brick construction.

Truro, N.S.
Addition to post office, cost $40,000. Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, C. W. Hewitt, Dept. of Public Works. Three storeys, 40 x 40. Plans in progress.

School house, cost $35,000, Willow, planned by town council. Two storeys.

Victoria, B.C.
Orange Hall, cost $30,000. Building Committee; J. G. Gimason, W. Duncan, O. J. B. Lane, 627 Courtney street. To be erected on North Park street between Cook and Quadra streets. Plans in progres.

Walkerton, Ont.
Library. Tenders received by Chairman of Board, Jas. Warren, for all trades. Specifications, at office of Geo. Gray, Arch., Harriston, Ont., and Jas. Warren.

Windsor, Ont.
Shelter, cost $6,000, for Children's Aid Society. President, A. McNee. Architects, Crane and Pennington, Boug Bldg., are preparing plans.

Woodstock, Ont.
Police headquarters, cost $10,000, planned by city council. Clerk, Jno. Morrison. By-law to be submitted May 12th.

CONTRACTS AWARDED

Canboro, Ont.
Church, cost $6,000, for Methodist Congregation. Sec.-Treas., Alfred Misener. General contractor, Fred. Mitchell, Sinclairville. Masonry, F. Smith, Caledonia, Ont.

Dunwich Twp., Ont.
School, cost $3,000, planned by Dunwich and Aldborough School Board. General contractor, W. Saunders, Dutton, Ont. Seating, etc., required.

Hamilton, Ont.
Alterations to moving picture theatre, cost $5,000, 66-68 King street west, for H. Levitt, Lister Chambers, general contractor. Architects, Watt & Blackwell, Lister Chambers. Felt and gravel roofing, seating (500).

Ottawa, Ont.
Laboratory, cost $10,000, Slater St., planned by the City. Architect, F. C. Sullivan , Queen street. Work is being done by day labor under supervision of architect. Heating, plumbing and fixtures, A. Gauthier & Co., Dalhousie St. Solid brick construction, cement foundation.

Port Dalhousie, Ont.
School, cost $8,500, Queen street, for Roman Catholic School Board. Architect, A. E. Nicholson, St. Catharines. General contractor, J. H. Gardner, Aqueduct, Welland, Ont. Two storeys, 40 x 80.

Regina, Sask.
College, cost $90,339, for St. Chad's. Architects, Brown & Vallance, 1006 McArthur Building, Winnipeg. General contractor, R. J. Lecky, Regina. Three storeys.

South Edmonton, Alta.
Public school, cost $147,300, 3rd St. E. Architect, G. E. Turner, Rice street. General contractors, Reed, MacDonald & Brewster Ltd. Two storeys and basement, 17 rooms, pressed brick construction, concrete foundation, Bedford stone trimmings.

Thedford, Ont.
School, cost $8,500. Clerk, Wm. Brooks. Architect, W. R. Fawcett, 152 Essex street, Sarnia. General contractors, Gill & Oliver, Grand Bend, Ont. One storey and bacement, 77 x 30, brick construction, brick and concrete foundation.

Winnipeg, Man.
School, Clifton street, planned by Board of Education. Architect, J. B. Mitchell, Commissioner of School Bdgs., William and Ellen streets. General contractors, Sutherland Construction Co., 512 Builders' Exchange. 30 rooms, brick construction.

Business Buildings and Industrial Plants

Berlin, Ont.
Shoe factory, contemplated for A. G. Gourlay, Galt, Ont. Three storeys, 150 x 40, brick construction. Plans in progress.

Dundas, Ont.
Addition to printing office, for Dr. Lyman Lauchland. Architect, A. K. Gilmour, Dundas. Two storeys, 50 x 15, brick construction. Plans in progress.

East London, Ont.
Lithographic plant for H. J. Jones, 311 Wolfe street. Architects, McBride & Gilbert, Edge Block, London. One sty. and basement, 60 x 160, Milton pressed brick construction, cement foundation. Plans in progress.

Edmonton, Alta.
Business block, cost $40,000, for M. Runnalls, 140 Jasper avenue west, and Dr. Nicholls, 152 Jasper avenue east. Architect, E. C. Hopkins, Jasper avenue. Two storeys, to be built now, 4 storeys to be added later. Plans in progress.

Fort William, Ont.
Warehouse, cost $100,000, river front, for International Harvester Co. of America. Five storeys, 200 x 100, approximately, piles, reinforced concrete construction. Plans in progress.

Fredericton, N.B.
Addition to warehouse and repairs to wharf planned by city council. Clerk, J. W. McCready. Warehouse will be extended 35 ft. and wharf planked.

Granby, Que.
Warehouse contemplated by the Empire Tobacco Co. Two storeys, 79 x 160. Plans in progress.

Hamilton, Ont.
Addition to warehouse, cost $10,000, Oxford, for Geo. E. Tuckett & Sons, Queen street north. Tenders received by architects, Stewart & Witton, H. P. & L. Bldg. One storey addition, 76 x 190, brick construction.

Two stores and apartments, cost $10,000, James street north, for R. Phillips, 481 King street east. Architect, Jas. Balfour, 36 James street south, is re-drawing plans as first were too costly. Tenders will be called shortly.

Lake Megantic, Que.
Brush and broom factory, cost $10,000, for P. Cliche, Beauce Junction. Ratepayers voted on by-law granting owner loan of $7,000, exemption from taxes for 10 years, company will be organized under the name of the Lake Megantic Broom Company.

Medicine Hat, Alta.
Foundry ,Powell Sub-division, for The Industrial Iron Works, Ltd. Promoters, Jos. W. Hamilton & Floyd T. Richfield. One building to be 40 x 80, to be used as machine shop, foundry same size, $20,000 will be invested in machinery and $15,000 in buildings. Permit issued.

Montreal, Que.
Warehouse, cost $19,500, for Mt. Royal Mfg. Co., 1548 St. Patrick street. Three storeys, 42 x 132, felt and gravel roofing. Plans ready.

Garage, cost $40,000, Ann, for M. L. H. & P. Co., Power Building, Craig street. General manager, J. S. Norris. Four storeys, 159 x 87, felt and gravel roofing. Plans ready.

Ottawa, Ont.
Stores and apartments, cost $40,000, for F. X. Laderoute, 85 Bank street. Architect, E. Measter, Creighton street school. Three storeys, solid brick construction, cement foundation. Plans drawn.

Addition to factory, cost $25,000, for Campbell Steel & Iron Works, Carling ave. Architect, Alex. Campbell, Carling ave. Two storeys, structural steel and brick construction, concrete foundation. Additional machinery and equipment will be required. Plans in progress.

Office, cost $5,300, Laurier ave. west, for O'Connor Estate, c/o Architect, W. E. Noffke, Central Chambers. Solid brick construction, stone foundation, Plans drawn.

Stores, cost $15,000, Sparks street, for N. D. Porter, Bank street. 48 ft. frontage, cement foundation, solid brick construction. Plans drawn.

Stores and offices, cost $150,000, Rideau street, for Blackburn Bros., Creighton street. Architect, W. E. Noffke, Central Chambers. Fireproof building, designed to be taken to 10 storeys later. Eight storeys. stone and structural steel construction. Plans in progress.

Warehouse, cost $50,000, for S. J. Major & Company, 18 York street. Architect, C. P. Meredith, 126 Sparks. Four storeys, reinforced concrete construction, concrete foundation. Plans drawn.

Peterboro, Ont.

Store, cost $5,000, Hunter west, for Mr. James Murty, 380 Brock street. Three storeys, 35 x 100, red presed brick construction, cement and stone foundation. Plans in progress.

Prince Albert, Sask.

Linseed oil factory, cost $100,000, contemplated by The Great West Iron, Wood & Chemical Co. Manager, Felix Frank. Plans in progress.

Regina, Sask.

M. B. Steine, 502 St. Paul street, Montreal, Que., is contemplating erecting factory for manufacture of shirts.

St. John, N.B.

Factory. Oil Motor & Mfg. Co., Ltd., will apply for charter, capital $150,000. Will purchase machinery for the manufacture of oil engines and other internal combustion engines. President, Dr. E. J. Broderick. Secretary, A. E. Massie. Directors, M. L. G. Vincent, Richard Sullivan, T. J. Terry.

Saskatoon, Sask.

Business block, cost $250,000, 3rd Ave., for J. C. Drinkle, c/o Architects, Thompson & Crockart, Masonic Temple. Five storeys, 75 x 140, structural steel, brick, stone and mill construction. Plans in progress.

Stores and apartments, cost $45,000, 25th street and Avenue C, for G. B. Colthurst, c/o Architects, Thompson, Daniels & Colthurst, Central Chambers. Three storeys, 50 x 100, brick construction, pool room in basement. Plans in progress.

Sault St. Marie, Ont.

Two stores and residence, cost $15,000, Queen street, for T. J. Irwin, 18 Denis street. Two storeys, 27½ x 65, cement foundation, cement blocks and pressed brick construction. Plans in progress.

Toronto, Ont.

Stable, cost $5,000, Dundas, for Geo. B. Hance, 199 Yonge street. Architect, J. P. Hynes, 199 Yonge street. Two stys., 24 x 40, brick construction, brick foundation. Plans drawn.

Stores, contemplated by National Railway Association. Secretary, J. Thompson, Room 18, No. 82 King street east. Company intend opening stores (wholesale meats and groceries) in many Ontario towns. Probable requirements, store fixtures, safes, furnishings and refrigerators.

Store and residence, cost $5,000, for Abe Adler, Dundas street. Architect, T. A. Fleming, 94 Laws street. Three stys., 24 x 51, brick construction, stone foundation. Plans drawn.

Store and residence, cost $6,000, Queen east, for F. Burgess, 36 Langley avenue. Architect, A. J. Rattary, 123 Bay street. Two storeys, 20 x 52, structural steel and brick construction, brick foundation. Plans drawn.

Store and residence, cost $8,000, for E. J. Linington, 288 Dundas street. Architects, Chadwick & Beckett, 18 Toronto street. Three storeys, 24 x 50, structural steel and brick construction, brick foundation. Plans drawn.

One pair stores and residences, cost $5,000, Davenport road, for I, Schooley, 283 Concord. Architect, W. G. Hunt, 990 Bloor street west. Two storeys, 36 x 44, structural steel and brick construction, brick foundation. Plans drawn.

Store and residence, cost $3,000, Tyrell, for J. H. Mills, 38 Lansdowne avenue. Architect, Neil G. Beggs, 12 Cosgrave Building. Two storeys, 24 x 42, structural steel and brick construction, brick foundation. Plans drawn.

Three Rivers, Que.

Chemical factory, planned for General Chemical & Explosives Products Company. The North Shore Power Company are putting up wire for transmission of electricity to supply power to chemical works. Work is being supervised by Ralph B. McDunnough and Geo. Anderson.

Vancouver, B.C.

Office building, cost $600,000, Richards and Hastings streets, for J. W. Weart, 837 Hastings St. west. Architects, Russell, Babcock & Rice, 837 Hastings street west. Le Page, McKenny & Co., cor. Granville & Georgia streets, have been awarded contract for complete electric light, power, telephone, bell and fixture installation. Fifteen storeys, structural steel construction, pressed brick and terra cotta faced. Architects are sub-letting contracts.

Walkerville, Ont.

Factory, planned for American Lamp & Stamping Co. Interested, Geo. E. Edmunds and Wm. Jones, c/o Edmunds & Jones, Mfg. Co., Detroit, Mich. Site has been purchased, 250 x 65. Company will manufacture auto lamps and plumbing supplies.

Weyburn, Sask.

Stove factory, Avondale, planned by The Cleveland Mfg. Co. President, L. A. McLean. Agreement has been signed with city to build and operate large plant. Company has purchased [illegible] acres of land.

Windsor, Ont.

Alterations to hotel, cost $6,000, Aylmer, contemplated by J. E. Peters. Architect not chosen yet. One storey addition, brick construction.

Winnipeg, Man.

G. T. P. Rly. contemplate erecting large addition to hotel on Broadway.

CONTRACTS AWARDED

Berlin, Ont.

Office building, for Berlin Lion Brewery. Mason, Caspar Braun, 149 King west. Carpenter, Adam Dengis. Two storeys, 86 x 41.

Brantford, Ont.

Warehouse, cost $5,000, Brant street, for Brantford Cordage Co. Manager, Chas. L. Messecar. Mason and carpenter, H. I. Overbough, Grand View, Brantford. Roofing, Brantford Roofing Company.

Bridgeburg, Ont.

Factory, cost $18,000, Lewis street, for Chicago Bridge & Iron Works, Chicago. Local Supt., C. Gregory. Work is being done by day labor, machinery required. One storey, 100 x 160, cement foundation, frame construction. Excavating started.

Brunner, Ont.

Flour mill, cost $7,000, for Pfeffer Bros. Manager, W. Pfeffer. General contractor, Samuel Smith. Machinery to be purchased.

Calgary, Alta.

Stores and rooms, cost $6,000, 14th west, for N. M. Haskim, 1 street west. Builder, J. Taylor, 112 11th avenue east. Two storeys, 35 x 50, brick, cement foundation. Excavating started.

Fort William, Ont.

Factory, cost $6,000, for Springett Brading & Co., Ltd., Christina street. Architect, builder and general contractor, Owner. Woodworking machinery required.

Hamilton, Ont.

Addition to factory, cast $19,000, Napier street, for B. Greening Wire Co., 55 Queen street north. Architects, Prack & Perrine, 36 James street south. General contractors, H. G. Christman Co., Chancery Chambers. One storey, brick construction.

Montreal, Que.

Factory and office building, cost $120,000, Bleury, for Southam Press, Ltd., 63 St. Alexander. Architects, Brown & Vallance, 32 Canada Life Building. General contractors, Atlas Construction Co., Ltd., 37 Belmot street. Ten storeys, 51 x 65, cement foundation, reinforced concrete construction. Excavating started.

Factory, cost $82,273, Maisonneuve, Notre Dame east, for St. Lawrence Sugar Refineries, Ltd., Dom. Express Building. Iron and steel, Dom. Bridge Co. Ten storeys, adjoining present plant. Steel and brick construction, concrete floors.

Two stores and 4 flats, cost, $15,000, Maisonneuve, Ontario and Bourbonniere. Owner and builder, G. Lepine, 1459 Ontario street east. Foundations started.

Ottawa, Ont.

Stores, cost $15,000, Sparks street, for N. D. Porter, Bank street. General contractor, R. Holmes, 80 Arlington street. 48 ft. frontage, solid brick construction, cement foundation.

Shop and residence, cost $5,700, Preston. Owner and general contractor, Venance Landreville, 28 Murray. Brick veneer construction, stone foundation.

Peterboro, Ont.

Two factories, cost [illegible] each, Lansdowne, for De Laval Dairy Supply Co. Architects, Jno. W. Patterson Co. En-

(Continued on page 182)

Tenders and For Sale Department

CITY OF REGINA

SEWERS

[illegible] [illegible] [illegible] to the City Commissioners, Regina, Sask., will be received up until 12 o'clock noon, **May 15th, 1913**, for the following [illegible] [illegible]:—

(A) [illegible] and [illegible] of approximately
[illegible] lineal feet of 6-in. sewer pipe.
50,000 lineal feet of 8-in. sewer pipe.
20,000 lineal feet of 9-in. sewer pipe.
1,500 lineal feet of 10-in. sewer pipe.
15,000 lineal feet of 12-in. sewer pipe.
2,500 lineal feet of 15-in. sewer pipe.
7,000 lineal feet of 18-in. sewer pipe.
2,500 lineal feet of 24-in. sewer pipe.

(B) Supply and delivery of approximately:—
1,735 lineal feet of 30-in. concrete pipe.
1,025 lineal feet of 36-in. concrete pipe.
1,300 lineal feet of 42-in. concrete pipe.

(C) Supply and delivery of approximately:—
450,000 sewer brick.

(D) Supply and delivery of approximately:—
2,000 bbls. of cement.

(E) Supply and delivery of approximately:—
260 manhole covers.

(F) Supply and delivery of approximately:—
1,000 cubic yards of sand.

(G) Labor for laying sewers.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender.

The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

18-19 F. McARTHUR, City Engineer.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Customs Building, Ottawa, Ont.," will be received until 4 p.m., on **Wednesday, May 21, 1913**, for the construction of a Customs Building on Mackenzie Avenue, Ottawa, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of R. L. Deschamps, Esq., 103 St. Francois Xavier street, Montreal, and of Thos. Hastings, Esq., Clerk of Works, Postal Station "F," Yonge street, Toronto, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, for the sum of seventy-five thousand dollars ($75,000), which will be forfeited if the persons tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted, the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, April 22, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40459. 18-19

CITY OF ST. THOMAS

TENDERS

Tenders will be received by Geo. K. Crocker, Chairman of the Board of Water Commissioners, up till 12 a.m., **Thursday, May 15th**, for the following:—

(a) Excavation and back filling required for the laying of 16,000 feet of water mains.

(b) Laying the mains and pouring the joints.

Specifications and full particulars may be had from M. Ferguson, City Engineer, St. Thomas, or the office of the Contract Record and Engineering Review, Toronto, Ont.

S. O. PERRY,
Sec.-Treas., Board of Water Commissioners,
St. Thomas, Ont.

April 24, 1913. 18-19

Tenders for Concrete Bridge

Tenders will be received by the Board of Highway Commissioners, York County, until noon, **Monday, May 12th, 1913**, for the construction of a reinforced concrete arch over the Humber River, Lot 23, Con. 8, Vaughan near Kleinburg, Ont.

The tenders shall be delivered in sealed envelopes marked and addressed to R. W. Phillips, Secretary of the Commission, 57 Adelaide Street East, Toronto.

Plans and specifications may be seen at the office of Frank Barber, Bridge Engineer to the Commission, or the Office of the Chief Engineer to the Commission.

Lowest or any tender not necessarily accepted.

E. A. JAMES,
Chief Engineer.

Toronto, April 25, 1913. 18

TENDERS

Sealed tenders, addressed to the Secretary of the Department of the Interior, Ottawa, Ont., and marked "Tender for Bath-house, Banff," will be received up to noon, **May 30th, 1913**, for the construction of a bath-house at Banff, Alta.

Plans and specifications may be seen at the offices of the following:—

The Commissioner of Dominion Parks, Ottawa.
The Superintendent of Rocky Mountain Park, Banff, Alta.
The Chief Superintendent of Dominion Parks, Edmonton, Alta.
Messrs. Painter & Swales, Architects, Vancouver, B.C.
Agent of Dominion Lands, Calgary, Alta.
Agent of Dominion Lands, Regina, Sask.
Agent of Dominion Lands, Winnipeg, Man.

The lowest or any tender not necessarily accepted.

The unauthorized insertion of this advertisement in any newspaper will not be paid for.

LYNDEWODE PEREIRA,
Secretary.

Department of the Interior,
—40598. Ottawa, April 24th, 1913. 18

CITY OF PORT ARTHUR

Tenders for Waterworks Department

Scaled separate tenders, for each section will be received by the undersigned up to 5 o'clock p.m. of **Monday, May 12th, 1913**, for the construction of sections 1 to 10 inclusive of the new Force Main.

The work includes the trenching necessary, the laying of steel piping, valves, specials, etc., and constructing valve chambers.

Approximate quantities:—
Trenching and laying 12-in. steel pipe, 6,000 ft.
Trenching and laying 24-in. steel pipe, 40,000 ft. in single and double trench.

Trenching and laying 2,500 ft. duplicate 24-inch intake in Lake Superior.

Material supplied by the Corporation.

Plans and specifications can be seen at the office of T. Aird Murray, 303 Lumsden Building, Toronto, or at office of L. M. Jones, City Engineer, Port Arthur, Ont.

A marked cheque for five per cent. of the cost of the work must accompany each tender.

The lowest or any tender not necessarily accepted.

J. J. HACKNEY.
Corporation Offices, Port Arthur,
April 21st, 1913. 18-19

Tenders for Power Plant Equipment

Sealed tenders, registered and endorsed on the envelope, Tender for (tender bidden on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the town of the Pas, will be received up to 6 p.m., **May 20th, 1913**, for the supply and delivery of the following machinery and materials:—

Tender "A"—For the supply, delivery and erection of two crude oil engines.

Tender "B"—For the supply, delivery and erection of two generators, exciters, switch, and other apparatus.

Tender "C"—For the supply and delivery of, approximately,
4400 ft. of 12-in. steel pipe or cast iron pipe.
3500 ft. of 10-in. steel pipe or cast iron pipe.
4400 ft. of 8-in. steel pipe or cast iron pipe.
2000 ft. of 6-in. steel pipe or cast iron pipe.
50 specials.

Tender "D"—For the supply and delivery of 30 hydrants, 52 gate valves, and boxes.

Tender "E"—For the supply and delivery of two pneumatic storage tanks.

Marked cheque for five per cent. (5 p.c.) of the amount of the tender must accompany each bid. The lowest or any tender not necessarily accepted.

For the supplying of materials, the tender forms must be filled in, copies of which are attached to the specifications, or are obtainable at the Consulting Engineer's offices.

Plans and specifications may be seen at the offices of the Consulting Engineers, Saskatoon, Sask., "The Canadian Engineer," Toronto, Winnipeg and Montreal, or a complete set of plans and specifications for any contract will be given, or forwarded, on a deposit of Twenty-five ($25) Dollars, and a set covering all the contracts on a deposit of One Hundred ($100) Dollars. If the prospective bidder sends in a bid on the tenders asked for, the deposit will be returned when the plans and specifications are returned.

H. H. ELLIOTT, M.D.,
Secretary-Treasurer,
The Pas.

Murphy & Underwood,
Consulting Engineers,
Saskatoon, Sask. 18-20

CITY OF RED DEER

Coat of Arms

The City of Red Deer offers a prize of $25.00 for a design for a Coat of Arms for the City of Red Deer.

The design should embody the figure of a red deer and symbolize dairying. Further information furnished on request.

Designs accepted up to June 1st.

A. T. STEPHENSON,
18 Secretary-Treasurer

Board of Education

TOWN OF BARRIE

Tenders in bulk or separate, will be received at the office of the undersigned until twelve o'clock noon of the **15th day of May, 1913**, for the several works required in the alterations and additions to the Collegiate Institute, Barrie, Ont. A certified cheque for 10 per cent. of the amount of the tender must accompany same, which will be forfeited should the contractor fail to sign contract. Plans and specifications may be seen at the office of Stewart & Witton, architect, Hamilton, Ont., and of the undersigned. The lowest or any tender not necessarily accepted.

FRED MARR,
Secretary-Treas., Board of Education,
18-19 Barrie, Ont.

CITY OF REGINA

Tenders for Trenching and Laying Water Mains

Sealed tenders, marked "Laying of Water Mains," will be received by the City Commissioners, Regina, Sask., up till noon, **May 12th, 1913**, for the Trenching and Laying of Water Mains, on certain streets in the City of Regina.

Specifications and other information may be obtained at the office of the undersigned.

A marked cheque covering 5 per cent. (five per cent.) of the tendered amount must accompany each tender.

Any or all tenders not necessarily accepted.

J. M. MACKAY,
17-19 Superintendent of Waterworks.

Tenders Wanted

CITY OF HAMILTON, ONT.

West End Sewage Disposal Works

Tenders will be received by registered mail only, addressed to [illegible] Allan, [illegible] Chairman Board of Control, up to 10 a.m., Tuesday, **May 6th, 1913**, for the construction of reinforced concrete [illegible] beds, pile foundations and all other structures required for the complete [illegible] sewage disposal plant.

Plans, [illegible] be obtained from the City Engineer, Hamilton, Ontario, upon receipt of $10, which amount will be refunded on return of the plans in good condition.

Lowest or any tender [illegible]

S. H. KENT, City Clerk.
Hamilton, Ont., April 17, 1913. 17-18

CITY OF BRANDON

Tenders for Sewer Pipe

Sealed tenders, addressed to the City Clerk, Brandon, and endorsed "Tender for Sewer Pipe," will be received until 12 o'clock at noon on Friday, **the 2nd day of May next**, for the following sizes of first quality vitrified salt glazed sewer pipe in carload lots, delivered in Brandon, freight and duty paid, viz:—

24-in., 15-in., 12-in., 10-in., 8-in., 6-in., 4-in. and junctions for the above sizes.

The Council of the City of Brandon does not bind itself to accept the lowest or any tender.

R. E. SPEAKMAN,
18 City Engineer.

CITY OF FORT WILLIAM

Waterworks Tunnels

Sealed tenders, addressed to the City Clerk and endorsed "Tenders for Tunnels," will be received up to 12 o'clock noon on **Thursday, May 29th, 1913**, for the construction of three tunnels in Hudson Shale, etc., with reinforced concrete lined shafts, viz.:

Tunnel under Kaministikwia River, 1,275 ft. long, 7 ft. wide, 8 ft. high, 119 ft. deep.
Tunnel under Mission River, 677 ft. long, 5 ft. wide, 6 ft. high, 95 ft. deep.
Tunnel under McKellar River, 629 ft. long, 5 ft. wide, 6 ft. high, 91 ft. deep.

Plans and specifications may be seen and forms of tender may be obtained at the office of T. Aird Murray, Esq., 303 Lumsden Bldg., Toronto, Ont.

Tenders must be sent in on form supplied. The lowest or any tender not necessarily accepted.

A. McNAUGHTON, City Clerk,
Fort William, Ont.
RAY R. KNIGHT, City Engineer,
Fort William, Ont.
T. AIRD MURRAY, Con. Eng.,
Toronto, Ont.
Fort William, April 26, 1913. 18-21

Sealed tenders addressed to the undersigned, and endorsed "Tender for Geodetic Survey Office Building, Ottawa, Ont.," will be received until 4 p.m., on **Monday, May 12, 1913**, for the above mentioned building on the Dominion Observatory Grounds, Ottawa, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, April 16, 1913.

[illegible]
17-18

THE CITY OF CALGARY

Sealed tenders, marked "Tenders for Municipal Laboratory Equipment," addressed to the City Commissioners, will be received at the office of the undersigned, up to 5 p.m. of **May 7th, 1913**, for supplying the City of Calgary with apparatus, equipment and supplies for a Municipal Testing Laboratory.

Specifications and particulars may be obtained on application at the City Clerk's office.

The lowest or any tender not necessarily accepted.

J. M. MILLER, City Clerk.
Calgary, Alta, April 18, 1913. 17-18

Tenders Wanted

Sealed tenders, whole or separate, will be received by the undersigned up to and including the **15th day of May, 1913**, for all trades required in the erection and completion of a Public Library Building at Walkerton, Ont.

Plans and specifications can be seen at the office of the undersigned, Walkerton, Ont., on and after this date, or at the office of Geo. Gray, architect, Harriston, Ont.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
17-19 Chairman Library Board.

Department of Railways and Canals, Canada.

TRENT CANAL

Notice to Contractors

Lock Gates, Ontario-Rice Lake Division

Sealed tenders, addressed to the undersigned, and marked "Tender for Lock Gates, Trent Canal," will be received at this office until 16 o'clock on **Monday, May 26th, 1913**.

Plans, specifications and form of contract to be entered into can be seen on or after April 23rd, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of Superintendent Engineer, Trent Canal, Peterborough, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of $5,000 made payable to the order of the Minister [illegible] tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security for the due fulfilment of the contract to be entered into.

[illegible]

By [illegible]

L. K. JONES,
[illegible]
Department [illegible]
Ottawa, 22nd April, 1913

[illegible] out authority from the Department will not be [illegible]

CITY OF BRANDON, MAN.

[illegible]ed tenders, addressed to the City Clerk, [illegible] Cast Iron [illegible] until 12 o'clock [illegible] **Friday, the 2nd day of May next**, for [illegible]

12 in.—about 2,000 ft., 85 lbs. per foot
10 in.—about 11,000 ft., 65 lbs. per foot
6 in.—about 30,000 ft., 30 lbs. per foot

[illegible] Crosses, [illegible]

[illegible] Council of the City of Brandon does not [illegible] tender.

R. E. SPEAKMAN,
City Engineer.

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at [illegible] offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Wharf and Dredging at Belleville, Ont.," will be received at this office until 4 p.m. on **Tuesday, May 20, 1913**, for the construction of a Wharf and Dredging at the city of Belleville, County of Hastings, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department, and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, P.Q., and on application to the Postmaster at Belleville, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the persons tendering dceline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted, the cheque will be re[illegible]

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

[illegible] Works,
Ottawa, April 21, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from [illegible] 18-19

TENDERS

Sealed tenders, marked "Tender for Departmental Building," and addressed to the undersigned, will be received at this office up to noon on **Saturday, May 10th, 1913**, for

Additions and Alterations

to the Departmental Building, corner Hollis Street and Cheapside, Halifax, N.S.

Drawing and specifications may be seen at the Department of Public Works and Mines, and at the office of Herbert E. Gates, Architect, Halifax, N.S.

Tenders must be accompanied by a certified cheque for 5 per cent. of the amount of the tender.

The lowest or any tender will not necessarily be accepted.

E. H. ARMSTRONG,
Commissioner Public Works & Mines.
Halifax, N.S., April 15, 1913. 17-18

CITY OF REGINA

Pavements and Sidewalks

Sealed tenders addressed to the City Commissioners, Regina, will be received up until 12 o'clock noon, **May 15th, 1913**, for the following works:—

(A) Approximately 150,000 sq. yds. of street pavement.
(B) Approximately 32,000 sq. yds. of track pavement.
(C) Approximately 80,800 lineal feet of crub and gutter.
(D) Approximately 2,300 lin. ft. of straight curb.
(E) Approximately 558,000 sq. ft. of concrete sidewalk.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender.

The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

16-19 F. McARTHUR, City Engineer.

Tenders for Dredging

Toronto, Canada

The Toronto Harbor Commissioners have in preparation plans and specifications for the removal of approximately 35,000,000 cubic yards of material by hydraulic dredging.

Borings indicate seventy per cent. of material to be sand and gravel, thirty per cent. mixture of sand, silt and clay.

Each dredge must be capable of handling at least 600 cubic yards per hour at maximum length of discharge.

From source of supply to point of discharge maximum distance is about 6,000 feet. Average length of delivery required about 4,000 feet.

Direct line of discharge preferred, but consideration will be given to work being done in series or by relays.

Day and night operation required.

The plans and specifications will be ready on April 28th, 1913. Tenders for all or part of the work will be received up to 12 o'clock noon, May 28th. Work to commence August 1st, 1913.

Borings, plans and specifications, tender forms, etc., and general information relating to the work can be seen at the Engineering Department of the Commission, 76 Adelaide Street West.

Communications relative thereto to be addressed to E. L. Cousins, Chief Engineer.

All tenders to be sealed and addressed to A. C. Lewis, Secretary, Toronto Harbor Commissioners.

The Commissioners do not bind themselves to accept the lowest or any tender.

17-19 L. H. CLARKE, Chairman.

CITY OF PORT ARTHUR
PROVINCE OF ONTARIO

Tenders for Pumps, Etc.

Tenders will be received by undersigned up to **May 19th**, for three motor driven centrifugal pumps of two thousand gallon per minute capacity, together with pumping valves, meters, switchboard, and all necessary apparatus for operating same.

Specification and tender form can be seen at office of L. M. Jones, City Engineer, Port Arthur, Ont., or T. Aird Murray, Consulting Engineer, Lumsden Building, Toronto, or at the Winnipeg offices of Contract Record & Engineering Review and Canadian Engineer. Ten per cent. deposit. Lowest tender not necessarily accepted.

J. J. HACKNEY.
Port Arthur, April 28, 1913. 18

Tenders for Bridge Construction

Sealed tenders, plainly marked as to contents, will be received at the office of the undersigned, up to noon of **Friday, May 9th, 1913**, for the construction of concrete abutments and concrete bridge floor or concrete piers and concrete shore spans and bridge floor over the Nottawasaga River between the Townships of Essa and Sunnidale near Angus, Ont.

Plans, specifications and all necessary information may be obtained at the office of the undersigned, 57 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Consulting Engineer.
Toronto, Ont., April 28, 1913. 18

CITY OF KINGSTON

Tenders for Pavement

Sealed tenders will be received by the undersigned up to 3 o'clock p.m., **Monday, May 5th, 1913**, for the construction of approximately 6,630 square yards of pavement, 2,150 lineal feet concrete curb and gutter, and 1,500 lineal feet of concrete gutter.

Plans and specifications may be seen, and all other information obtained at the City Engineer's office, Kingston, Ont.

A marked deposit cheque of 5 per cent. is required.

The lowest or any tender not necessarily accepted.

R. J. McCLELLAND,
City Engineer.
April 18th, 1913. 17-18

TOWN OF SIMCOE
PROVINCE OF ONTARIO

Sewerage Works

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on **Saturday, May 10th, 1913**.

Contract "P"—Sewage pumping station.
Contract "X"—Sewage disposal works.

Plans and specifications may be seen at the office of the engineers, Toronto, or at the Town Hall, Simcoe, Ont.

No tenders necessarily accepted.

L. C. GIBSON, Esq., Mayor.
W. C. McCALL, Town Clerk.
CHIPMAN & POWER, Engineers.

18-19

CITY OF REGINA

Sealed tenders, registered and clearly marked on the outside of the envelope "Tender for Power House Equipment," and addressed to the City Commissioners at Regina, will be received up until noon of **May 15th, 1913**, for the supply of:—

One pair vertical boiler feed pumps; each pump's capacity to be 7,500 imperial gallons per hour.

One combined open heater and meter, capable of handling 125,000 lbs. feed water per hour.

Copies of specifications may be had from Mr. E. W. Bull, Superintendent of Light and Power, Regina, Saskatchewan. A marked cheque for five per cent. of the amount of bid must accompany each tender.

The City Commissioners reserve the right to reject any or all tenders. 17-18

Enlargement of Aqueduct for Montreal Water Works

Direction of Public Works

Sealed tenders addressed to the Board of Commissioners of the City of Montreal, City Hall, and endorsed "Tender for Enlargement of Aqueduct," will be received at the office of the Board of Commissioners in the City of Montreal until twelve o'clock noon, on **Friday the 16th day of May next (1913)** for the works to be done for the enlargement of the City's Aqueduct, forebay and tail-race, by widening and deepening same on a length of about 31,000 feet.

The work comprises about 2,350,000 cubic yards of earth excavation and about 436,000 cubic yards of rock excavation. The transporting of the excess excavated material; the construction of reinforced and unreinforced concrete retaining sidewalls containing about 203,000 cubic yards of concrete, the construction of syphon culverts, etc., etc., the whole according to plans, cross-sections and specifications to be seen at and obtained from the office of the Superintendent of Water Works, Montreal.

Tenders must be made on blank forms to be obtained from the office of said superintendent and shall be sealed and filed no later than the hour above stated.

No tender will be entertained unless made upon the blank form above mentioned and unless accompanied by a certified cheque on a chartered bank of the Dominion of Canada and payable at the City of Montreal to the City Treasurer, for the sum of $200 000 (two hundred thousand dollars) which cheque shall be enclosed in the same envelope as the tender.

The tenders will be opened in the presence of the interested parties by the Board of Commissioners at a regular meeting held in their ordinary meeting room, at noon, on the 16th day of May, 1913.

Copies of the specifications and plans may be obtained from the office of the Superintendent of Water Works on payment of the sum of $20. To bona fide tenderers this amount will be refunded.

The Board of Commissioners reserve the right to reject the lowest or any tender.

By order of the Board of Commissioners.

L. N. SENECAL, Secretary.

Office of the Board of Commissioners,
City Hall, Montreal, April 9, 1913. 18

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
C **1515 Rockefeller Bldg., Cleveland, O.**

FOR SALE

Stone crusher, portable, with elevator. Also 16 h.p. gas engine, portable. Enquire Box 775, Contract Record, Toronto, Ont. 18-19

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

FOR SALE

Dredge and Derrick and Tug, Portable Crusher, and 20 horse power Boiler and Engine, 12-ton Case Roller, "steam steerer," 19 Dump Waggons, Wheel and Drag Scrapers, Shovels, Hammers and Picks. All in good working order and cheap. Apply to H. A. Camjaigne, Niagara House, Niagara Falls, Ont. 10-T.F.

Horses For Sale

Lumber Company closing out Ontario operations has 50 pairs prime logging horses for sale at Webbwood, Ont. See page 86 of this issue. Wolverine Cedar & Lumber Co., Sault Ste. Marie, Mich., or Webbwood, Ont. 18

A large firm manufacturing carbon brushes for all kinds of service desires good electrical or supply firm or else good salesman to represent them in various parts of Canada. Apply Box 772, Contract Record & Engineering Review, Toronto, Ont. 18-19

Wanted

Large United States firm manufacturing the best carbolineum wood preserver on the market is considering the advisability of making an arrangement with some concern in Canada to handle their products on a royalty basis. For particulars address Box 784, Contract Record, Toronto, Ont. 18-19

Any concerns or individuals in building and construction business who desire to tender for contracts to architects, builders and owners write or enclose business card to Advertiser, who will introduce a profiable proposition. This particularly applies to new firms and those seeking means of extending their business. Box 769, Contract Record, Toronto, Ont. 17-20

Situations Wanted

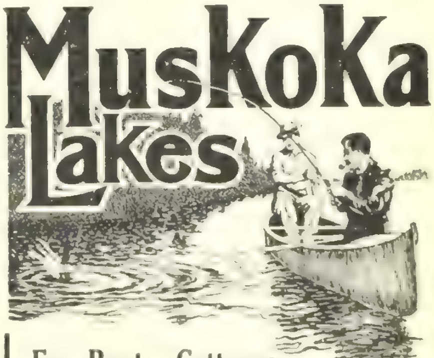
Young engineer, technical graduate, wishes opening with good firm of contractors. Would take full charge of contract on salary and commission. Box 776, Contract Record, Toronto, Ont. 18-19

New Companies

Keelesdale Realty Company, Limited, has been incorporated with a capital of $150,000, to carry on business as a land and building company with head office at Toronto. The provisional directors are W. R. Anderson, W. B. Stirrup, law clerks, and J. F. MacGregor, accountant, all of Toronto.

The Metropolitan Engineering Company of Canada, Limited, has been incorporated with a capital of $100,000, with head office at Toronto. The provisional directors are J. S. Lundy, barrister, C. G. O'Connor, law students, of Toronto.

The Charcotate Limited has been incorporated with a capital of $500,000, to erect buildings and deal in building materials, with head office at Toronto. The provisional directors are Jas. Foley, barrister, Wm. McKim, broker and D. J. Coffey, law student, all of Toronto.



For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where "the breezy call of incense-breathing morn" will put new life in mind and body. Muskoka offers more real healthful enjoyment for less money than any other resort in the world.

Four cottages to rent $125 to $200 on Bohemia Island less than a mile from Royal Muskoka Hotel and good Golf Links. Box 771

Contract Record, Toronto Ont.

FOR SALE
Steam Shovel, Locomotives and Dump Cars

1 "Marion" Steam Shovel, Model 50, Shop No. 2131; new in 1910; only handled about one hundred thousand yards.
2 Portable Locomotives, narrow gauge, 10" x 16"; saddle-tank in excellent condition.
14 "Allison" Dump Cars; narrow gauge; one-way; 4-yd.

All or any part of the above equipment ready for instant delivery; now in Montreal. Address:

Canadian Stewart Co., Ltd., Eastern Townships Bank Building **Montreal, Canada**

gineer, W. J. Smith. General contractors, [illegible]. One storey, 112 x 208 ft. 9 in. each, white brick construction, stone and cement foundation.

Prince Albert, Sask.

[illegible], 1st avenue west and 17th street, for the Owners Garage Co., Ltd. Architects, Creighton and Crowther, K. C. Building. General contractors, Bonas Bros. Three storeys, [illegible]

Regina, Sask.

[illegible] 11th avenue, for [illegible], 1020 Darke Block. General contractors and architects, McDiarmid and Donelly. One storey, 60 x 120, brick construction and foundation, felt and gravel roofing. Excavating started.

St. John, N.B.

[illegible], Market Square, for Bank of British North America. Architects, Barrot, Blackader & Webster, Montreal, and G. E. Fairweather, St. John. General contractors, B. Mooney & Sons, 112 Queen street. Painting, Jas. Pullen, 16 Horsefield street.

Sudbury, Ont.

Alterations and addition to hotel, cost $25,084, for D. Morin, Esq., White House. Architects, Angus & Angus, North Bay. General contractor, J. B. Laberge. Three storeys and basement, 90 x 42, structural steel and local brick construction, local stone foundation.

Toronto, Ont.

Alterations to office building for Toronto Mortgage Co., 13 Toronto street. General contractors, Robt. Long & Sons, Richmond east. Remodelling heating and ventilating system, Webster Modulating.

Addition to factory, cost $15,000, for American Watch Case Company, 511 King west. Architect, G. W. Gouinlock, Temple Building. Mason, Wickett Bros,. 35 Deer Park Crescent. Carpenter, Jas. Sim, 372 Markham street. Heating and plumbing, Robt. Long & Sons, Richmond east. Foundations in.

One pair stores and residences, cost $5,000, Carlaw and Victor. Owner and builder, Robert Luxton, 581 Pape Ave. 2½-storeys, 36 x 42, structural steel and brick construction, brick foundation.

Walkerville, Ont.

Addition to office building, for Canadian Bridge Company. Architects, Albert Kahn, E. Wilby Association, 58 La Fayette avenue, Detroit, Mich. General contractors, Victor Williamson, Huron and Walker road. Work to start shortly.

Westboro, Ont.

Store and residence, cost $5,000, for Geo. Watson, Main street. General contractors, Geo. Eaman & Sons, O'Conner street Ottawa. Brick construction, stone foundation .

Windsor, Ont.

Warehouse, cost $3,000, Caron and Wyandotte. Builders and general contractors, Cadwell Sand & Gravel Co. One storey, 50 x 141, cement foundation, reinforced concrete construction. Foundations in.

Double store, cost, Chatham, for J. W. Douglas. Architect, Clare Williamston, Walkerville. General contractor, Geo. W. Sewall, 219 Ouellette avenue. Carpenter, Elmer Gignac, 83 Pelissier. Iron and steel, Geo. Sewall, 219 Ouellette avenue. Roofing, painting, heating, heating, plumbing, Owner. Electric, J. Clark, 11 Elliott. Two storeys, 40 x 94, cement and brick foundation, brick reinforced concrete construction.

Winnipeg, Man.

Stores, cost 20,000, Main, for Lennon & Shea, Woodbine Hotel. Architect, E. W. Crayston, 572 Ross avenue. General contractor, A. Blow, 680 Furby St. One storey, 100 x 100, brick construction and foundation. Excavating started.

Residences

Calgary, Alta.

Res., cost $4,000, Mt. Pleasant, for W. Tosh, 225 14th avenue west. Two stys., 19 x 36, frame, cement foundation. Plans drawn.

Edmonton, Alta.

Apartment house for Geo. Harry Price, Alberta Hotel. Site has been purchased and plans will be prepared.

The Edmonton Permanent Investment Co., Ltd., has been incorporated to erect apartment houses. Interested, Frank B. Matthews, 2299 McKenzie avenue, H. H. Parlee, 3246 Jasper avenue east.

Essex, Ont.

Residence, cost $5,000, Alice street, for Dr. A. G. Snell. Architects, G. Jacques & Co., Boug Building, Windsor. Two storeys, 25 x 37, stone and cement foundation, brick construction. Plans in progress.

Hamilton, Ont.

Seven residences, cost $30,000, Springer avenue, for A. O'Heir, Bank of Hamilton Building. Architects, J. A. Armes & Walter Scott, Federal Life Building. 2½-storeys, 26 x 40, pressed brick construction, stone foundation. Tenders received by architect.

Montreal, Que.

Detached residence, cost $8,000, Westmount. Western avenue, for Mr. F. H. Anson, 466 Cote road. Architect, E. G. M. Cape, New Birks Building, Montreal. Brick construction. Plans drawn.

Ottawa, Ont.

Residence, cost $6,000, Powell, for R. A. Kemp, 149 1st ave. Brick veneer construction, stone foundation. Plans in progress.

Residence, cost $4,000, for Robt. Slack, 86 Elm street. Brick veneer construction, stone foundation. Plans drawn.

Residence, cost $8,000, for C. S. Smith, 289 Clemow. 2½-storeys, brick veneer construction, stone foundation. Plans in progress.

Residence, cost $5,400, Bronson, for L. R. Gauthier, 285 Mutchmore. Two stys., brick veneer construction, stone foundation. Plans drawn.

Residence, cost $7,000, Powell, for John A. Bell, 344 Waverly. Architect. Geo. Tomlinson, 348 Waverly. 26 x 36, brick veneer construction, stone foundation. Plans drawn.

Toronto, Ont.

Apartments, cost $15,000, Lansdowne, for W. & A. Hutchins, 167 Pearson Ave. Three storeys, 47 x 90, brick construction, stone and cement foundation. Plans drawn.

One detached residence, cost $4,500, Sheldrake Boulevard, for A. E. F. West, 951 Dufferin street. Architect, J. H Stanford, Bloor and Ossington. 2½-storeys, 26 x 33, brick construction and foundation. Plans drawn.

Residence, cost $18,000, Russell Hill road, for H. C. Tomlin, 418 Bathurst. Architects, Sproatt & Rolph, 90 Yonge street. 2½-storeys, 44 x 61, structural steel and brick construction, brick foundation. Plans drawn.

One detached residence, cost $6,000, Glengrove, for J. G. Taylor, 724 Spadina avenue. Architect, V. L. Morgan, Confederation Life Building. 2½-storeys, 26 x 38, structural steel and brick construction, brick foundation. Plans drawn.

Walkerville, Ont.

Residence. Tenders received by Architects, N. H. Feldman & Alfred Seeler, 802 Breitmeyer Building, Detroit, Mich. Two storeys and basement, 44 x 58, frame construction.

Westboro, Ont.

Residence, cost $5,000, for James Brown, Highland avenue. Brick veneer, construction, stone foundation. Plans in progress.

Winnipeg, Man.

Residence, cost $6,000, for G. S. McKay. Architect, R. R. Evans, 506 Somerset Building. 2½-storeys and basement, 34 x 32, brick veener construction, concrete foundation. Plans, specifications, etc., at office of Architect, who will receive tenders till May 1st, 1913.

Residence, cost $4,500, will be erected by Heinite Investment Company, 423 Bannerman avenue. Two storeys, 26 x 29, frame, stone foundation. Excavating started.

Woodroffe, Ont.

Residence, cost $5,000, for H. A. Fern, Edgeworth road. Two storeys, brick veneer construction, stone foundation. Plans in progress.

CONTRACTS AWARDED

Calgary, Alta.

Terrace, cost $10,000, McLeod Trail, for Mrs. Beattie. Builder, Mr. Black, 19th avenue and 4th street west. Two storeys, 30 x 80, frame, cement foundation.

Residence, cost $10,000, Mt. Royal, for A. Martin, 8th avenue east. Architects, Holman & Jorch, Dominion Bank Building. General contractors, Bennett & Debnam, Crescent Heights. Two stys., 40 x 36, brick and frame construction cement foundation.

Residence, cost $5,000, Roxborough Place. Owners and builders, Leech, McLaren & Lowther, 108 25th avenue west. Two storeys, 24 x 39 ft. 6 in., frame construction, cement foundation.

Residences, cost $8,000, Sunalta, for W. H. Shaw, 1530 13th avenue west. Builder, W. H. McDonald, 319 14th avenue west. Two storeys, 30 x 32, brick, cement foundation. Excavating started.

Hamilton, Ont.

Twelve residences, cost $40,000, Blake street. Owner and general contractor, T. W. Reid, 98 Eastbourne avenue. Concrete foundation, pressed brick construction. Permit granted.

Residence, cost $6,000, for J. Lewis, Dundas road. Architects, Rastrick &

STEFFENS & NOLLE, Limited

Exclusive Agents for L. MANNSTAEDT & CIE.

OUR STOCK AT MONTREAL consists of over **300 TONS** of **PLAIN, ORNAMENTAL** and **SPECIAL** Rolled Steel **SECTIONS.** Over **300** different **SHAPES** for the manufacture of fireproof buildings, warehouses, residences, folding gates, store fronts, marquise elevator cages and enclosures, bridge, structural, steel and concrete stairs, railings, iron door frames, ornaments, etc.

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Mild Steel Bars, all shapes, Angles, Tees, Zeds, Channels, I Beams, Zores-Beams, Plates, Checkered Plates (4 patterns). Sheets of all kinds, Toe Caulk Tire and Sleigh Shoe Steel, Genuine Russian Sheets, Swedish Iron, Cast Steel Bars, Stay Bolt and Refined Iron, Wheel Tires, Hammered Steel Forgings and Shafting up to 70 tons, Boiler Tubes, Seamless Round and Square Tubing, Lapwelded Steel Pipes for Water and Gas Mains and all purposes, Steel Castings and Gears up to 50 tons.

Head Office - Berlin, Germany

Branch Offices: Bombay, India Buenos Ayres, Argentine Sydney and Melbourne, Australia

Canadian Office and Sample Rooms: 802-3-4 Shaughnessy Building
137 McGill St. Warehouse: 134-136 Prince St.
MONTREAL, QUE.

[illegible] on King street east. General contractor, Wm. Middleton, Ancaster, Ont., all [illegible] contracts. Two storeys, 40 x 40, brick and stone construction, stone foundation.

London, Ont.

Residence, cost $[illegible]. Owner and builder, C. A. Hennigar, 92 Maple St. Two storeys, stone and cement foundation, white brick construction.

Montreal, Que.

Three residences, cost $21,000, Wilson. Owner and builder, Art. Cloutier, 245 Kensington. Two storeys, 26 x 70, Excavating started.

Ottawa, Ont.

Apartments, cost $12,000, for V. Bangs, Cooper street. Architect, W. Herbert George, Castle Bldg., Queen street. General contractor, E. Monette, 60 Sterling. Carpentry, Gibson Bros., 708 Gladstone. Heating and plumbing, J. T. Blythe, Bank and James. Other contracts not let. Three storeys, brick veneer construction.

Residence, cost $12,000, Clemow, for D. E. Johnstone, Westminster Apts. Architect, J. Albert Ewart, 193 Sparks street. Masonry, Chas. Holbrook & Sons, Lewis street. Foundations in.

Residence, cost $9,000, Clemow, for Mr. Allan, c/o Allan & Cochrane, Sparks street. Architect, W. Herbert George, Castle Bldg., Queen street. Mason, B. Webb, Pretoria. Carpenter, C. Nichols, 589 McLeod. Pliumbing and Heating, J. A. Langelier, 310 Wellington. 2½ storeys, pressed brick construction. Foundations in.

Nine flats, cost $6,000, Rozel. Owners and builders, A. & J. Lamarre, 612a Mullin. Three storeys, 50 x 40, felt and gravel roofing. Excavating done.

Eight flats, cost $10,000, 3 storeys, Maisonneuve. Builders and owners, Bernier & Gadbois, 746 Adam street. Excavating started.

Residence, cost $10,000, Guy. Owner and builder, Mr. Campbell, 26 Dorchester west. Two storeys, 45 x 32. Excavating started.

Prince Albert, Sask.

Residence, cost $9,000, 21st street west, for J. P. M. Sibbold, Central avenue. Architect, A. E. Seaford. General contractor, A. P. Anderson, 9th street east. Concrete foundation, brick construction.

Quebec, Que.

Residence, cost $5,250, for Mrs. L. Lefebore, 206½ Oliver street. Builders and general contractors, Louis Boivir Co., Richelieu street. Other trades not yet awarded. Three storeys, 40 x 60, brick and wood construction. Excavating started.

Regina, Sask.

Residences, cost $30,000, 5th avenue, for Dr. J. A. Henderson, 15th and McIntyre street. General contractors and architects, McDiarmid & Donelly, Two storeys, 30 x 270, brick construction and foundation. Foundations in.

Sault Ste. Marie, Ont.

Two flat residences, cost $6,000, for John Bunten, 37 Hughes street. Mason, David Jamieson. Carpenter, John Morrison. Two storeys and attic, 24 x 57, cement foundation, frame construction. Excavating started.

Toronto, Ont.

One detached residence, cost $4,000. Pleasant Blvd. Owners and Builders, Shaw Bros., 590 Bathurst street. 2½-storeys, 24 x 40, brick construction and foundation.

21 pairs residences, cost $105,000, Grace Terrace, Architect and builder, R. C. Bustard, 146 Confederation Life Building. Owner buys all material. work done by day labor. Work in progress.

One detached residence, cost $7,500, Biggar, for C. J. Musson, 94 Tyndall, Builder, J. Cooper, 81 Melville avenue. 2½-storeys, 34 x 42, brick construction and foundation.

One detached residence, cost $7,000, Glenview, Lot 159. Owner and builder, R. C. Bustard, Room 146, 7 Queen east. Owner buys material, work—day labor. 2½-storeys, 32 x 39, brick construction and foundation.

One detached residence, cost $5,500, Braemore Gardens. Owner and builder, R. C. Bustard, 146 Confederation Life Building. 2½-storeys, 33 x 40, brick construction and foundation.

Westboro, Ont.

Residence, cost $5,000. Owner and general contractor, R. E. Ralph. Brick construction, birch floors. Foundations in.

Windsor, Ont.

Residence, cost $7,000, Marentette, for Neil Reaume. Architects, Leybourne & Whitney, Davis Block. Two storeys, 32 & 40, cement and brick foundation, frame construction.

Residence, cost $6,500, Ouellette Ave., for A. G. Bellinger, 69 Chatham west. Architects, G. Jacques & Co., Boug Building. Mason, Geo. W. Sewall, 219 Ouellette avenue. Carpenter, Elmer Gignac, 83 Pelissier. Painting, C. M. Bennett, Walkerville. Heating and plumbing, J. L. Henreau. Electric, Deancon, Van Bustkirk & McVittie. Interior fittings, F. W. Phillips, 233 Bruce avenue. Two storeys, 38 ft. 6 in. x 35 ft. 10 in., cement foundation, brick construction.

Winnipeg, Man.

Five residences, cost $15,000, McDermot ave. Architects and general contractors, B. Robinson & Co., 654 Mountain ave. Two storeys, 24 x 30, frame construction. Excavating started.

Apartment block, cost $60,000, Spadina. Architect and general contractor, W. B. Lawrence, River ave. and Lewis street. Three storeys, 41 x 130, brick, stone foundation. Excavating done.

Residence, cost $13,000, Kingsway, for C. Isbister, 9 Ellesmere Apartments. Architect and general contractor, W. G. Davidson, 127 Canora street. 2½-stys., 39 x 40, frame, stone foundation. Excavating started.

Residences, cost $7,200, Anderson Ave. General contractor and architect, A. Doner, 580 Pritchard avenue. Two stys., 20 x 28, frame, stone foundation.

Residence, cost $5,000, Canora. Architect and general contractor, W. G. Armstrong, 110 Ethelbert street. 2½-stys., 29 x 30, frame, stone foundation. Foundations in.

Four residences, cost $15,000, Pacific avenue. Architect and general contractor, C. W. Fanthorpe, 544 Somerset Block. Two storeys, 20 x 26, frame, cement foundation. Excavating started.

Residence, cost $8,800, Montrose St. General contractor and architect, F. W. Walker, 326 Kingsway. 2¼-storeys, 34 x 32, frame, stone foundation. Excavation done.

Residence, cost $12,000, Yale. Architects and general contractors, The West End Realty & Building Company, cor. Portage and Lenore streets.

20 residences, cost $5,000 each. Architects and general contractors, The West End Realty & Building Company, cor. Portage and Lenore streets. To be erected on Dorchester avenue, Greenwood Place, Ruby street and McPhillips street.

Residence, cost $5,000, Bartlett. Architect and general contractor, J. Justice, 476 Scotland avenue. 2½-storeys, 26 x 28, frame, stone foundation. Excavating done.

Manse, cost $12,500, for Westminster Church, Maryland and Westminster aves. Architect, J. H. G. Russell, 1111 McArthur Building. General contractor, W. W. Cross, 54 Yale avenue. 2½-storeys, 39 x 40, brick construction and foundation.

Residence, cost $10,000, Dromore Ave. Architects and general contractors, Andrews & Sons, Portage and Victor. 2½-storeys, 30 x 36, brick veneer construction, stone foundation. Excavating started.

Power Plants, Electricity and Telephones

Camrose, Alta.

Telephone building, planned for Alta. Govt. Telephones Co., Edmonton. Excavation contractor, Richard Pallister.

Lingan, N.S.

Electric power plant, planned by A. C. Ross, Sydney, and Hon. W. S. Fielding, 216 Metcalfe street, Ottawa, to be erected for the purpose of supplying power to any new industries starting in Sydney or vicinity.

Strassburg, Sask.

Electric lighting plant, planned by town council. Plans, specifications, etc., at office of Sec.-Treas., S. L. A. Smyth, who will receive tenders till May 20th, 1913.

Winnipeg, Man.

Tenders received by Secretary, M. Peterson, until May 8th, for 6 100 kw. oil insulated, self-cooled transformers; 2 13,000 volt electrolytic lighting arresters; 6 100 amp. choke coils, for Beausejour & Stony Mountain sub-stations. Specifications, etc., at office of Engineer. Engineer, J. G. Glassco, 54 King street.

Two potential feed regulators for electric power distribution system required by Board of Control. Secretary, M. Peterson. Engineer, J. G. Glassco, 54 King street. General contractors, The Canadian General Electric Co., Ltd., 146 Notre Dame avenue, at $3,300 each.

Miscellaneous

St John, N.B.

Supplies. Commissioner of Water and Sewerage, R. Wigmore. Contract for terra cotta pipe and junctions awarded to Jas. Robertson Co., Ltd., Sheffield St., 20 tons iron castings, Jas. Fleming, 130 Pond street; 300 service stop cock boxes, 50 catch basin valves and frames, Union Foundry, 47 Union street west, East St. John. Barrels cement, W. H. Thorne & Company, Market Square.

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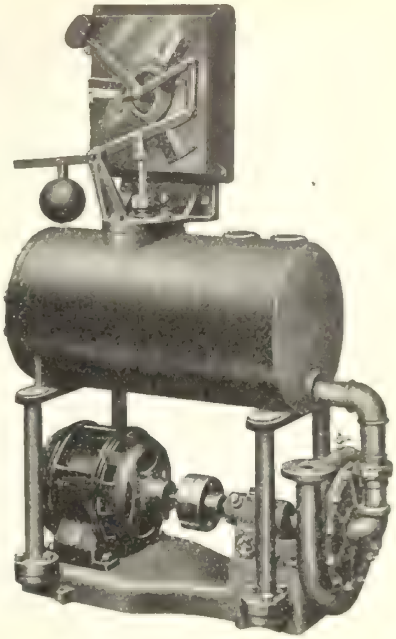
We show here a simple and effective means of draining steam jackets, heating systems, steam coils, drying cylinders, etc. The condensed steam is led to the inlet at the top of the receiver and falls to the bottom. The water in rising lifts a float switch and the motor starts and stops the pump automatically. This arrangement obviates the use of steam traps or tanks and, in addition, automatically returns to the boiler all water of condensation.



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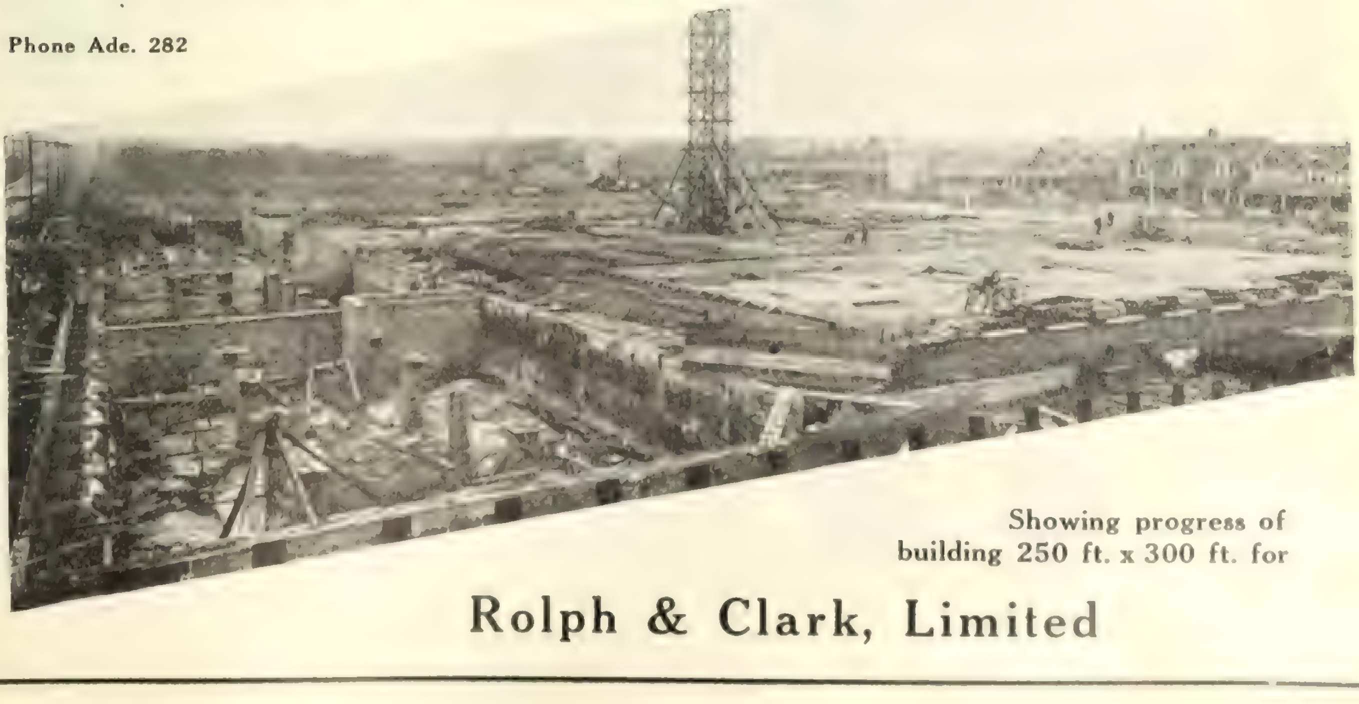

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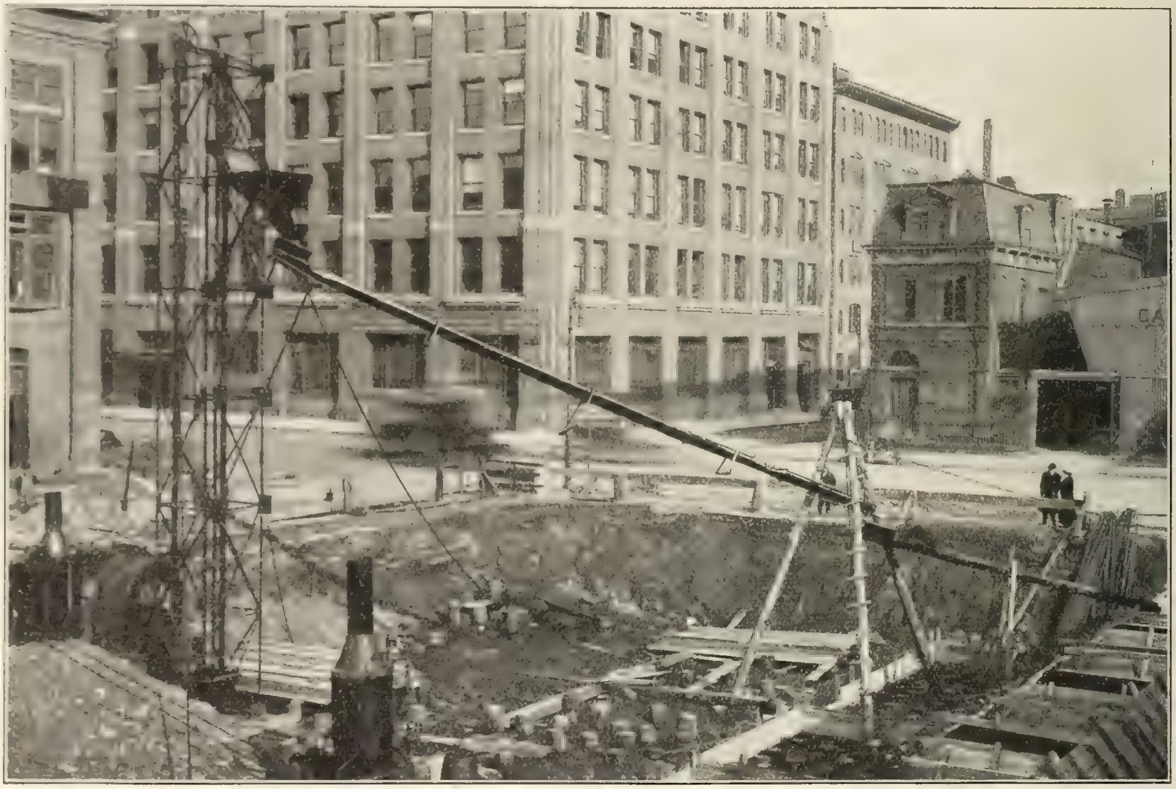

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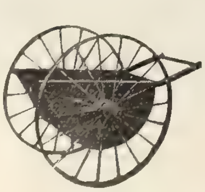

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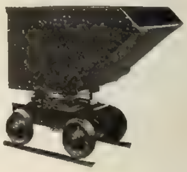

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Most of the big Canadian plants have installed **our** belting.

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Our Conveyor Belting is not the product of **yesterday**—but a long established "Service" Belting that has maintained its leading position through **years** of competition.

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It will prove itself.

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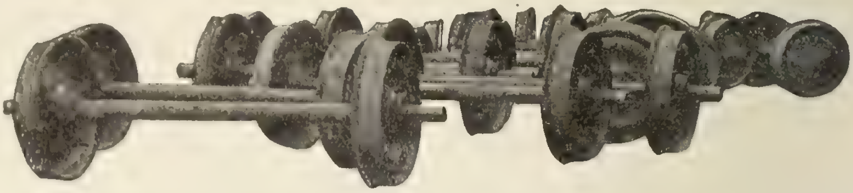

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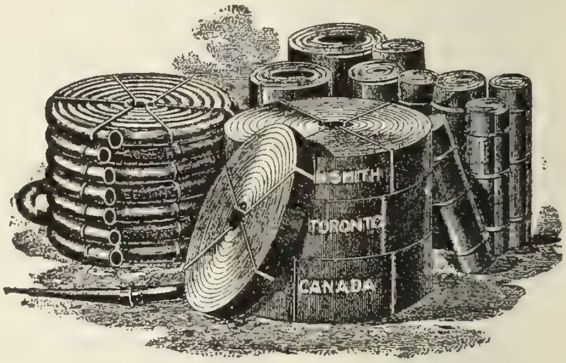

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Look over this list thoroughly, it will save you many dollars.

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Rubber Belting

Width inch	3 Ply	4 Ply	5 Ply	6 Ply
4	14	18	22	
5	18	22	27	
6	22	26	32	39
8		35	43	52
10	—	43	54	64
12	–	50	65	75
14		60	76	90
16	—	—	90	105

Stitched Canvas Belting

Width inch	4 Ply	6 Ply
4	14	21
5	17	25
6	20	30
8	26	38
10	33	47
12	38	57
14	—	73
16	—	83

We carry a complete stock of Belting in Rubber and Stitched Canvas, from 1 inch to 30 inches.

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with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

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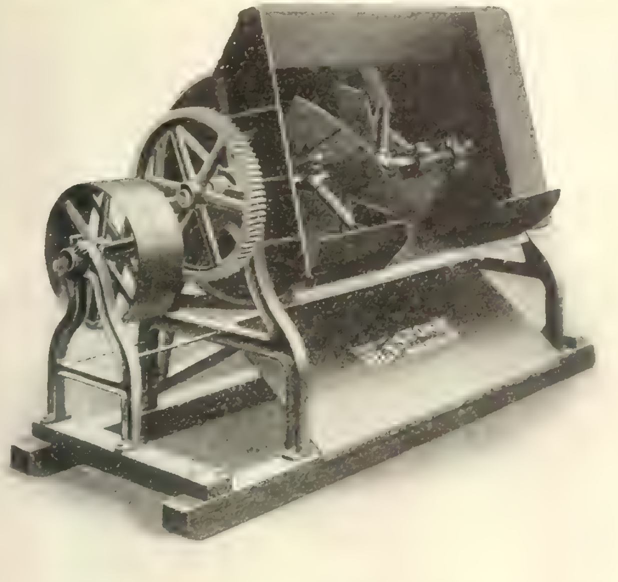

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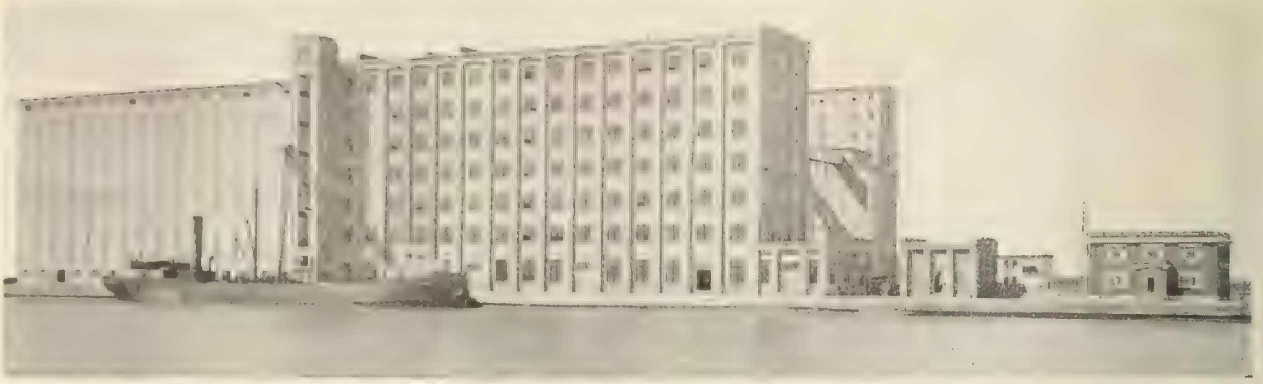

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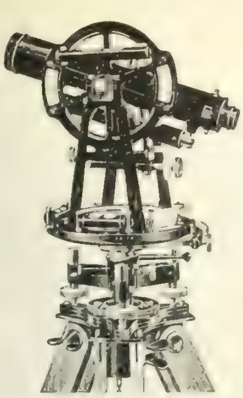

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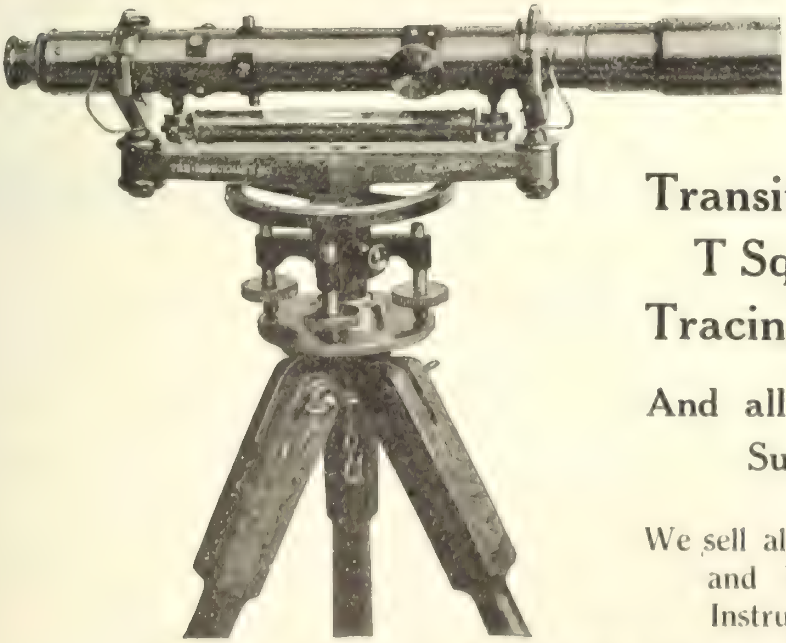

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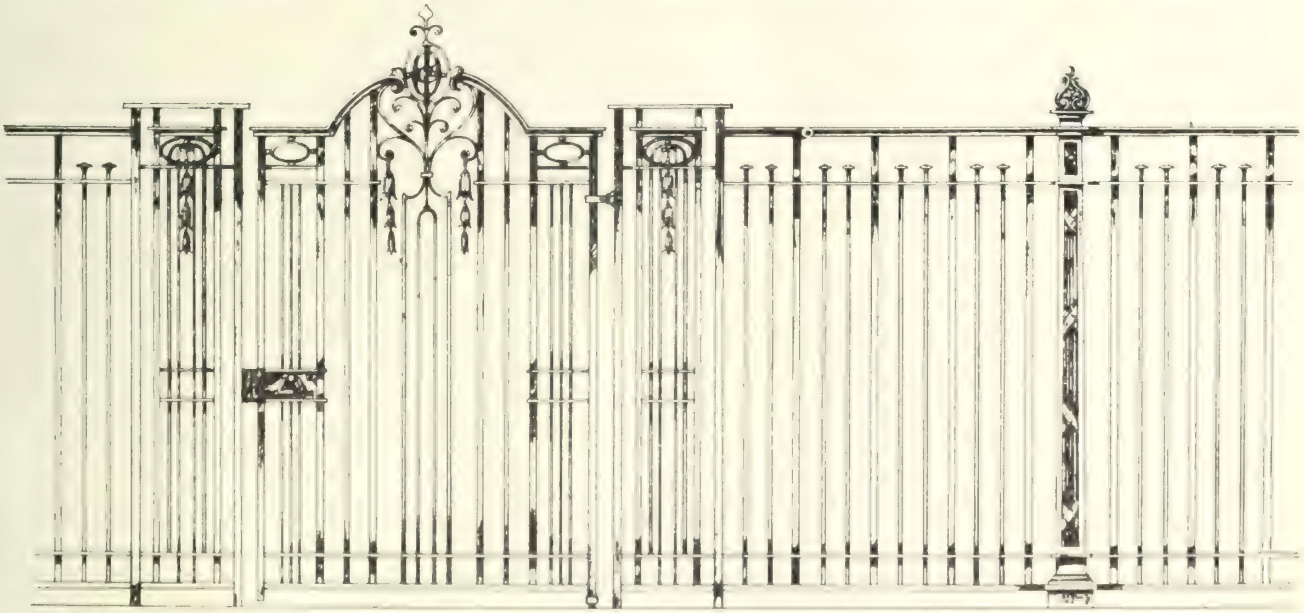

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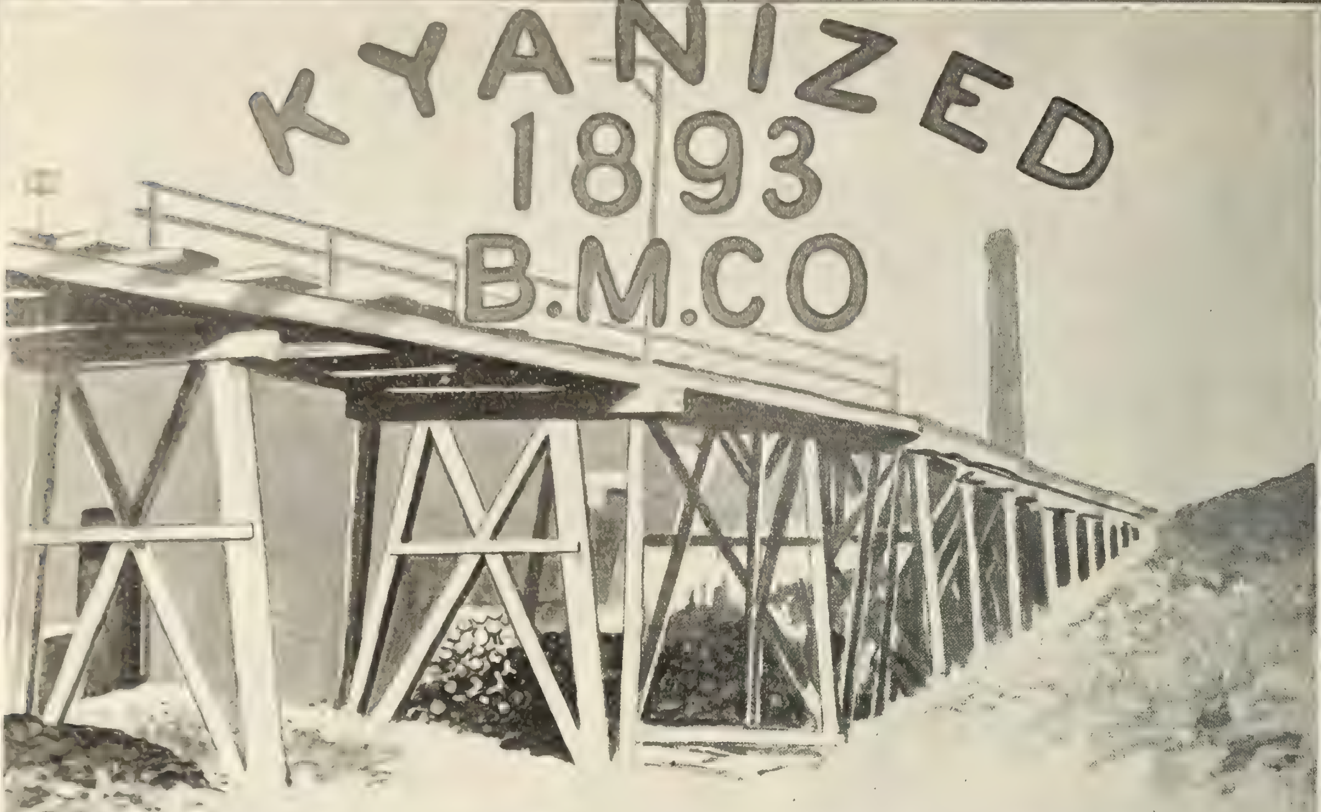

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There are repeated instances in which KYANIZED SPRUCE, used in wet basements, for railroad ties over undrained ground, etc., etc., is still in as good condition as when put in 60, 50, 40, 30 or 20 years ago.

The Kyanizing Process, used since 1840, has outlived and proven superior to all other wood-preserving processes.

Kyanized Spruce for Small and Large Bridges, Fences, Braces, Piles, Posts and other wood construction will insure long life and economy.

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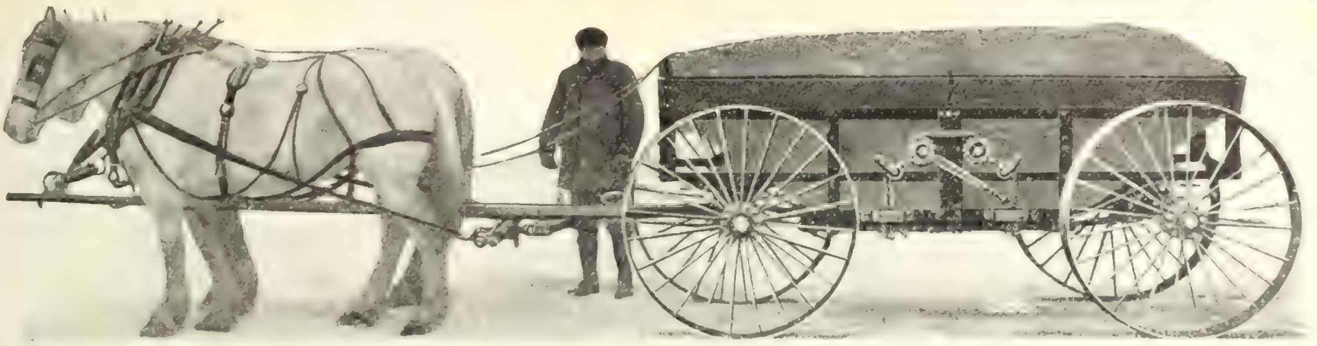
Berlin Mills Co., Portland, Me.

New York Office, 256 Broadway

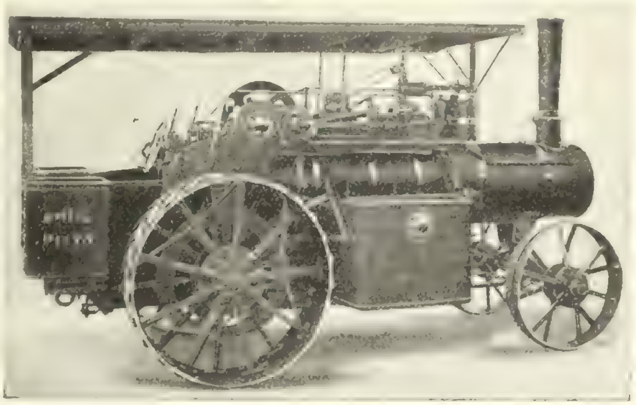


25% More Load with the Same Team.

YOU CAN MAKE MORE PROFIT IF YOU PAY MORE ATTENTION TO HAULAGE WORK

Write us about the loads you move and let us send you our proposition without delay.

Buffalo Pitts Co. new Reversible wagons in place of ordinary wagons whether you use horses or other traction power.



Two-Speed Road Locomotive.

New Two-Speed Locomotive — **Light Weight, with Extra Power.** Flat cleats arranged to give great traction power without cutting road. Cleats easily removed to secure smooth wheels for use on pavements.

BUFFALO PITTS CO.

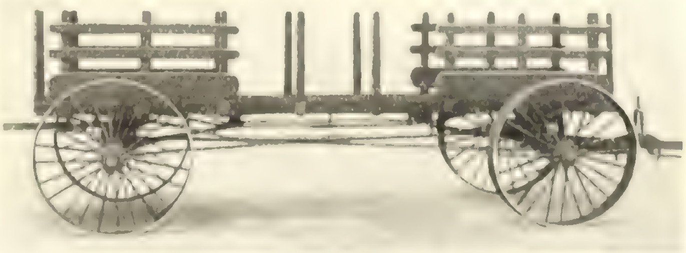
ROAD LOCOMOTIVES AND CARS

General Offices - Dept. B - BUFFALO, N. Y.

A New Type

The only Patent Reversible Gear of its kind, makes the car efficient in places where others are useless. So strong the train will not pull in two. So simple a boy can operate. The greatest time saver of the age. By simply throwing the reversing lever on the connecting hitch the train can be **reversed** to move either forward or back around the sharpest curves as well as in a straight line. Absolutely the only device where this is possible.

5-Ton, 3½-yd. Stone-Spreading Type. Also made in 10-Ton size.



5-Ton Convertible.

3½ yds. Patent Reversible Car Stone Spreading and Bottom Dump Styles, 5-ton size. Forged Steel Frame, steel wheels with special bronze bushings, special steel axles. 54-in. wheels with 8-inch tires. (Illustrated at left).

6½ to 8 yds.—10-Ton Wooden Frame Car same features of construction as described in 5-ton size.

5-Ton Freight Car, Convertible, equipped with different bodies for brick, cement, asphaltum, oil in barrels, pipe, timbers, or any kind of material. Has patent reversible gears.

All Types of Buffalo Pitts Co. Cars can be coupled in the same Train. Special cars made to order. Write today for full particulars. See Address above.

Royal Dominion Marble

was supplied throughout the

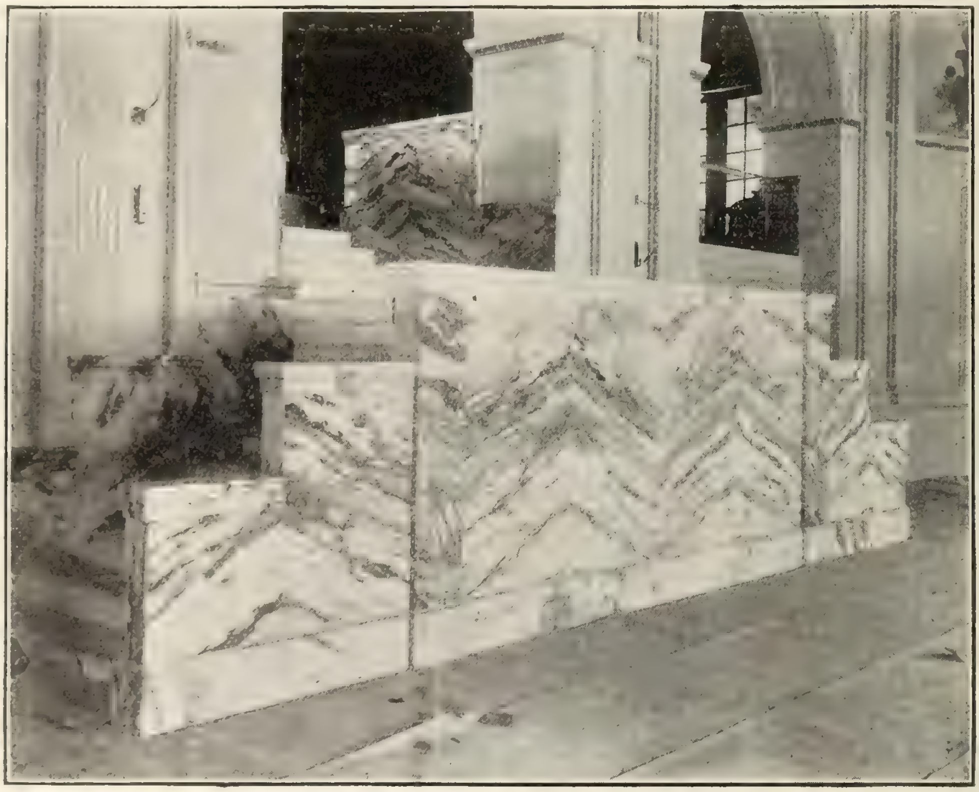
Canadian Pacific Railway Building,

Toronto, - - Ontario

Geo. A. Fuller Company,
Contractors

Darling & Pearson,
Architects.

It is being used in a great many prominent buildings in Canada and the United States.



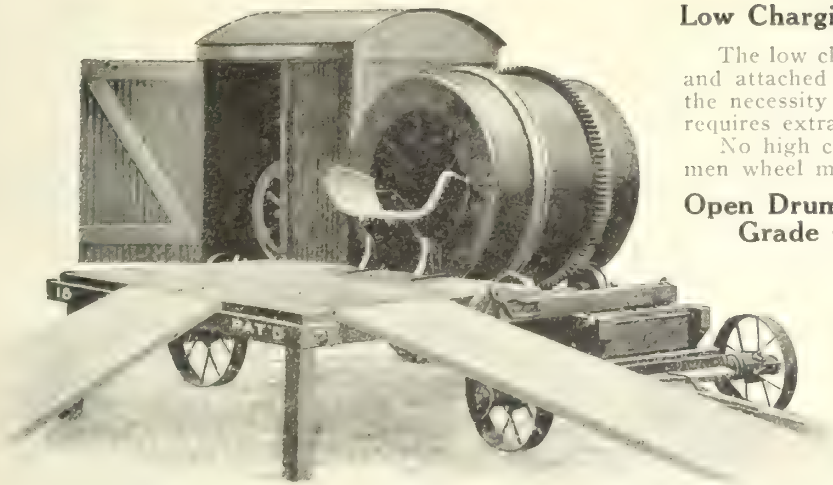
This cut shows a view of a stairway in the Chateau Laurier, Ottawa, in our Violetta marble. We can do as good work for you. Let us figure on your plans.

Dominion Marble Co., Limited

Montreal, - Canada

The machinery you use place a value on your work, and your work's value is the highest when you use

"The STANDARD" LOW CHARGING MIXER



Low Charging—Means—More Output

The low charging platform is only about 2 feet high and attached to the mixer. Low charging eliminates the necessity of buying complicated side loader which requires extra power and man to operate it.

No high charging to build and tear down and your men wheel more material.

Open Drum—Means—Uniform High Grade Concrete

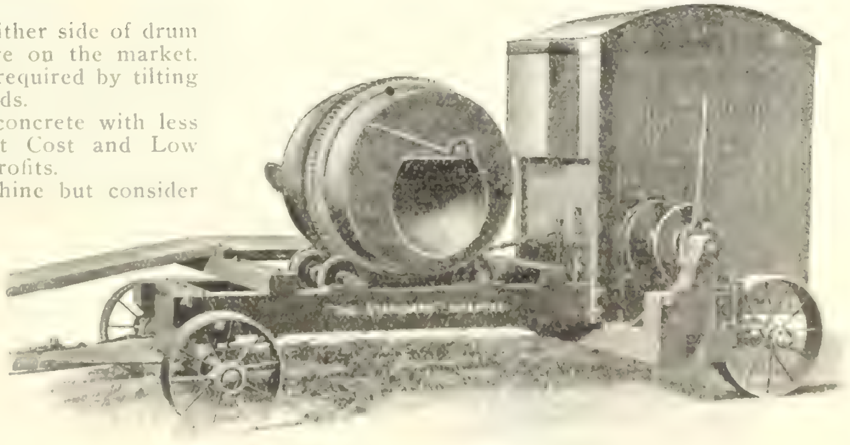
Don't guess at the conditions of your concrete but secure a mixer where the entire batch can be seen during its mixing process, this assures uniform mix. Note the wide opening in "The Standard" drum.

Semi Automatic Discharge—Means—Less Labor

This discharge can be operated from either side of drum and is the quickest and simplest discharge on the market. No extra man required to operate it as is required by tilting and other complicated discharging methods.

"THE STANDARD" will mix more concrete with less labor than any other mixer. Low First Cost and Low Operating Cost means addition to your profits.

Don't look at the beauty of the machine but consider whether or not it will run day and night, year in and year out, without breaking down and causing big repair bills. Ask the critical contractor what is the best machine and he will say "The Standard" eliminates the necessity of buying a separate hoisting equipment. This machine is particularly adapted for handling mixed concrete on building work, silos, towers, etc.



"The Standard" is built in ten different sizes, and with any kind of power, and is adapted to all classes of work. Various sizes in stock in Canada.

Every day that you are without "the Standard" you are losing money. You have lost hundreds of dollars already. Stop this leak by writing for our Catalog No. 45.

Special Canadian Representatives:

THE SMILEY CO.
546 First St.
Edmonton, Alta.

PIKE-PUTMAN MOTOR CO.
367 St. James St.
Montreal, Que.

THE STANDARD SCALE & SUPPLY CO.

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1345-1347 Wabash Ave.

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243-245 Water St.

NEW YORK
136 West Broadway

PHILADELPHIA
35 South Fourth St

THIS is the general-purpose Underwood — one of the 28 in the Underwood series.

There are over 6,000 Underwoods in Toronto — about 2,000 of all others

The Underwood costs a little more than other typewriters solely because it is worth more.

United Typewriter Co.
Limited
ALL CANADIAN CITIES

Sarnia Bridge Company Ltd.

Sarnia, Canada

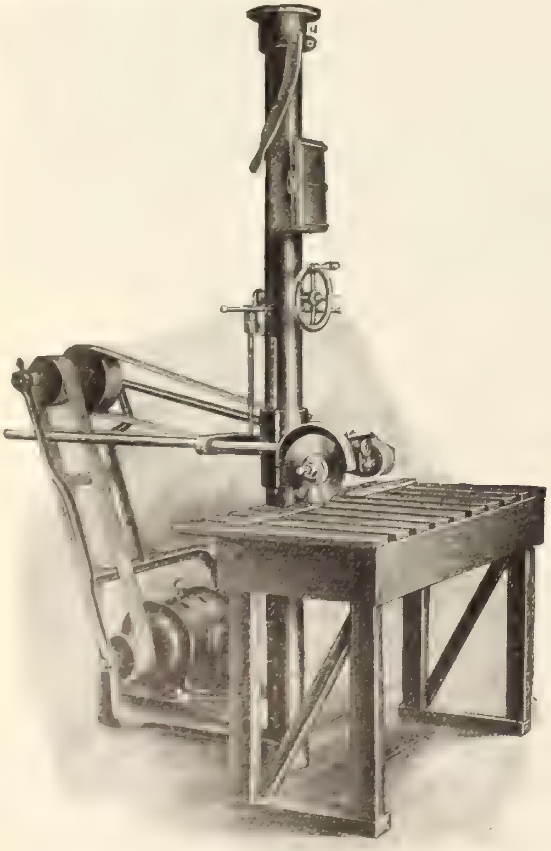
WE ARE MANUFACTURERS OF

Structural Steel of all Kinds

Railway and Highway Bridges
Steel Buildings

Beams, Channels, Angles, Plates, etc., in stock

Estimates and Designs Furnished on Application



Contractors and Builders
Get a
300 to 500% Guaranteed Saving

Actual Results Guaranteed or No Sale
Used Wherever Electricity is Available

The
"Hutchinson Combination Woodworker"

is particularly adapted for the following every-day work in any carpenter shop or building under Construction. Cutting Studs, Rafters, Braces, Boring for Dowelling, Tenoning, Dadoing, Pulley Stiles, Window Sills and Door Jambs, Routing, Stair Stringers, Mitreing of any kind, Tool Grinding, etc., and can be set to suit any of these purposes in one minute, and once set will do as much work in an hour as a carpenter will do in a day.

A Portable Woodworker for use wherever wood is to be part of the construction. Allows more work to be done with fewer skilled carpenters. Saves money from the day it starts. Costs only $2 or $3 a month for power.

WRITE FOR CIRCULAR

M. HUTCHINSON
1007 Eastern Ave., TORONTO, ONT.

"Steelcrete" Concrete Reinforcement

MAXIMUM EFFICIENCY AT MINIMUM COST

Bridge at Campbellford, Ont. "Steelcrete" Floor Reinforcement

One of the more than two hundred highway bridges throughout Canada with Steelcrete Expanded Metal Reinforcing for the floor slabs.

Slabs of concrete reinforced with "Steelcrete" Expanded Metal make a permanent bridge floor of the greatest strength, at the least cost, and with the least amount of superimposed dead load on the bridge. "Steelcrete" possesses an absolutely mechanical bond against vibration. It lies flat. Once placed, disarrangement is impossible. The meshes are diamond shaped, the joints absolutely rigid. There are no corrugated or twisted strands. When the load is applied there is no straightening out to split the concrete before the reinforcement comes into tension.

Specify "Steelcrete" fo

Floors, Roofs, Domes,
Tanks, Dams, Piers,
Sidewalks,
Foundations,
Warehouses,
Power Plants

Made in Canada:—Two Factories in Toronto, one in St. Catharines, Ont.

STEEL & RADIATION, LIMITED

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Head Office Fraser Ave.

MONTREAL
138 Craig Street West

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R. Max McCarty, St. John, N.B.
N. T. Dinnen & Co., Winnipeg, Man.

Canadian Supply & Equipment Co., Ltd.,
Calgary & Edmonton, Alta.
E. G. Cullen, Vancouver, B.C.

Fenestra
SOLID STEEL WINDOWS

Make Your Windows a

FENESTRA

A typical instance of Fenestra Solid Steel Sash—interior view. Note interior flooded with light from floor to ceiling.

The Strength of a Steel Window

must be gauged by the method of the intersection of the vertical and horizontal bars.

In most cases this intersection necessitates a loss of 50 per cent. of the Metal and therefore a great reduction of the strength at the joint.

The Fenestra Joint is a patented process of interlocking, and the amount of steel sacrificed by this union of muntin bars is less than 18 per cent. This patent joint gives Fenestra Sash a maximum resistance to wind pressure and contributes towards the life long durability of the window.

Construction

Fenestra Sash is made of solid rolled-steel bars of small weight, joined with the least loss of material and interlocked to obtain the greatest strength.

Superiority

This construction makes practically a continuous wall of glass reinforced with steel, which admits at least 35 per cent. more daylight than any wooden sash. Any amount of ventilation desired can be obtained.

Permanence

Every advantage that you obtain from Fenestra Steel Windows is a permanent asset of your plant.

Write us for information on your contemplated work—we can help you out on your daylighting problem.

Steel and

Head Office, Fraser Ave
TORONT

Fenestra
SOLID STEEL WINDOWS

Fenestra
SOLID STEEL WINDOWS

trong as Your Walls
DOES IT

A typical instance of Fenestra Solid Steel Sash—exterior view. Note neat appearance and ample ventilation.

Indestructibility

No "age limit" has ever been set for Fenestra. The old style wood sash begins to rot at an age of two years or upward, according to the character of its surroundings.

Fire-Proof

Walls of Fenestra are the greatest possible protection against fire. They are equally proof against the action of chemical fumes and coal gases.

Economy

You can depend upon Fenestra to keep in excellent condition without any of the repair and renovation necessary with wooden frames.

It is in **your own** interests, before building or remodelling any plant or factory, to investigate Fenestra Steel Sash—Write us.

Fenestra Sash Lets in Most Light

[illegible] greatest daylight surface because of the narrow solid bars, and is equipped [illegible]

The mechanical construction of Fen- [illegible] perience antedating all others. For the [illegible] permanent industrial buildings, Fenestra is the one adequate type of lighting equipment.

Radiation
Limited
138 Craig St. West,
MONTREAL

Fenestra
SOLID STEEL WINDOWS

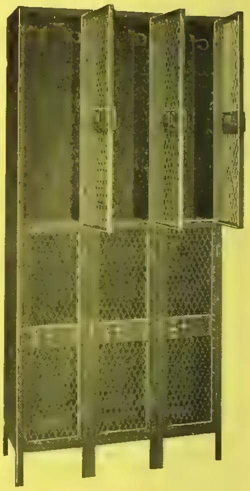
"STEELCRETE"
STEEL LOCKERS

"STEELCRETE"
STEEL LOCKERS

Locker Advantages

Wherever personal possessions must be left in the keeping of strangers, lockers provide the only really satisfactory arrangement of ensuring the safety of goods and the comfort of the possessor.

In waiting-rooms, dressing-rooms, cloak rooms, etc., lockers relieve those in authority of all responsibility of loss or damage and thereby form a permanent insurance against the many claims on property left in their charge.



"Steelcrete"
Steel Lockers

form a new type of safety lockers carefully thought out and designed and containing many advantages over the usual class of metal cage hitherto in use. These lockers are made all steel and are particularly suitable for

Warehouses, Gymnasiums, Schools, Clubs, Banks,
Hospitals, Police Stations, Armouries, &c.

Steelcrete Steel Lockers are finished in olive green enamel and are exceptionally **neat** in appearance, **clean and sanitary,** and **solid** as a block of wood. They are constructed throughout of the finest high-grade steel and are unequalled for their Strength and Rigidity.

The Standard Sizes and fittings, etc., are carefully calculated to meet every ordinary requirement.

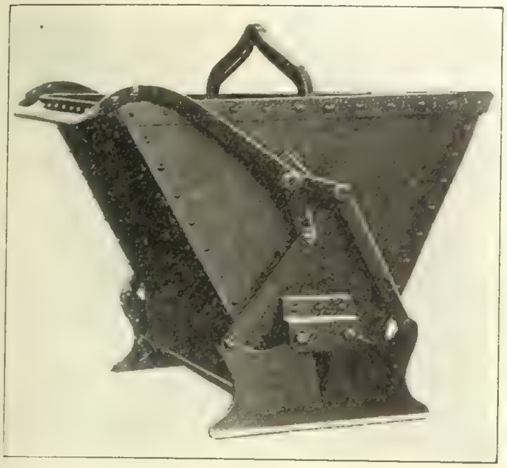
Made in "Single Tier" or "Double Tier" with sheet steel or expanded metal (open mesh) doors—combination locks or padlocks instead of rim locks if desired.

Write to Us—Our Prices will Interest You

STEEL and RADIATION
LIMITED
Toronto, Canada

"STEELCRETE"
STEEL LOCKERS

"STEELCRETE"
STEEL LOCKERS



Doud's Controllable Discharge Bucket

For depositing concrete in narrow forms, where the discharge must be under positive control.

We Have the Equipment! All We Ask is to Show You!

Doud's ACME Centre Dump Bucket

85 of these buckets of 1½ yd. capacity used in the Keokuk & Hamilton Water Power Development, Keokuk, Ia., U.S.A.

Doud's Concrete Spreader Cart

For Laying Concrete Base

Load under absolute control.

Low, Compact, Easily Handled.

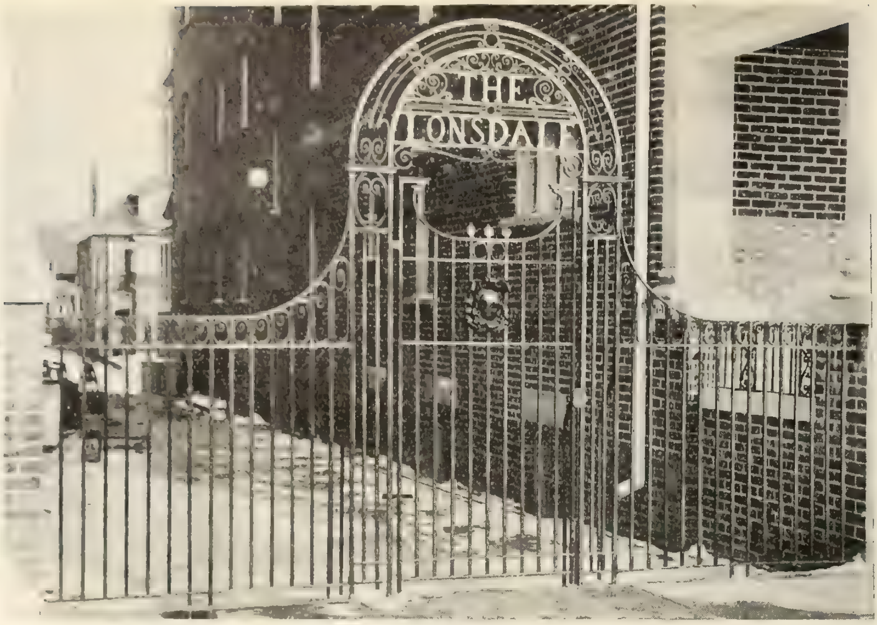
Doud's Combination Bucket and Car

Absolutely Controllable Discharge. Just the outfit for retaining wall construction, concrete sewers etc., where track can be laid over the forms.

The Acme Equipment & Engineering Co.

Garfield Building, Cleveland, Ohio

CANADIAN REPRESENTATIVES
F. H. Hopkins & Company, Montreal
N. J. Dinnen & Company, Winnipeg



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Moderate Prices

Ornamental Iron

To Your Specifications

Stairways in Wrought and Cast Iron
Fire Escapes
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Bank Counter Screens
Fences and Gates
Balconies Window Grilles
Lamps and Brackets
Light Structural Iron Work

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1195 Queen Street East, TORONTO

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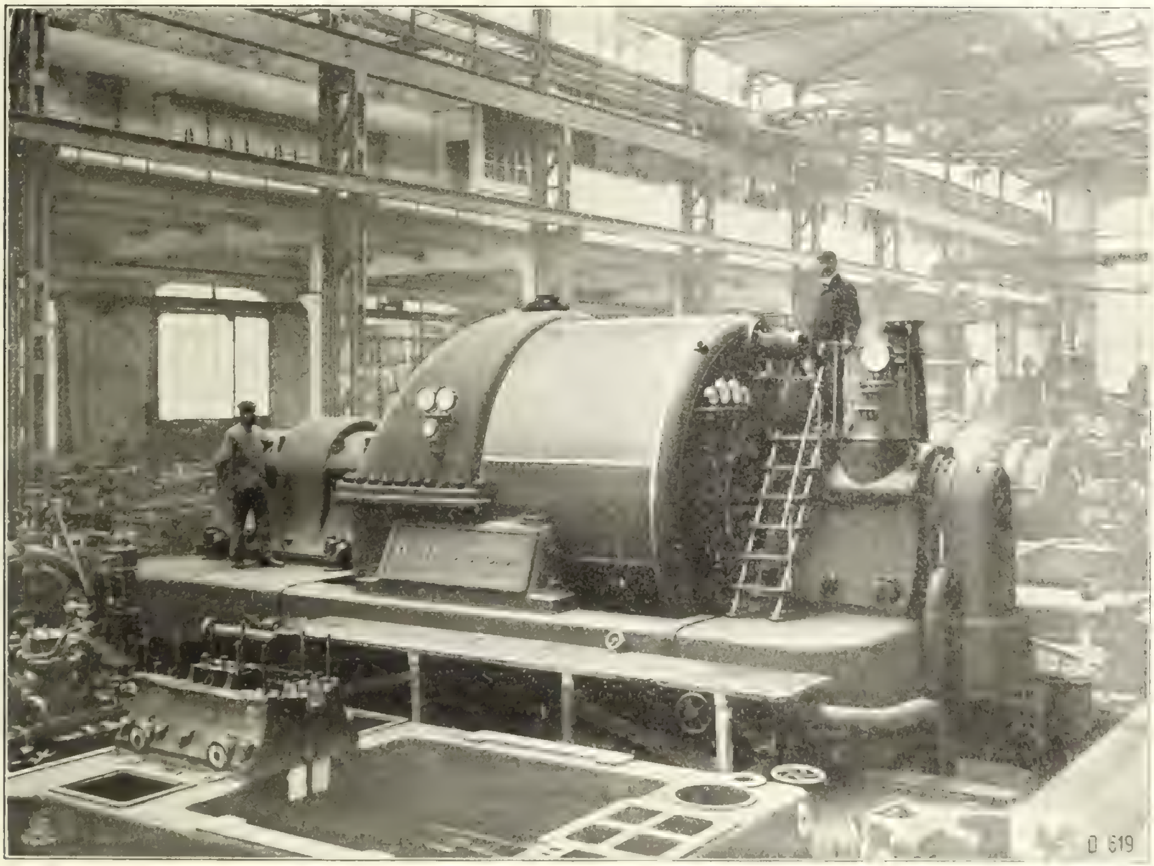

28,000 H.P. Zoelly Steam Turbine

Water Wheels
Impulse Wheels
Steam Turbines
Pumps

ESCHER WYSS & CO.

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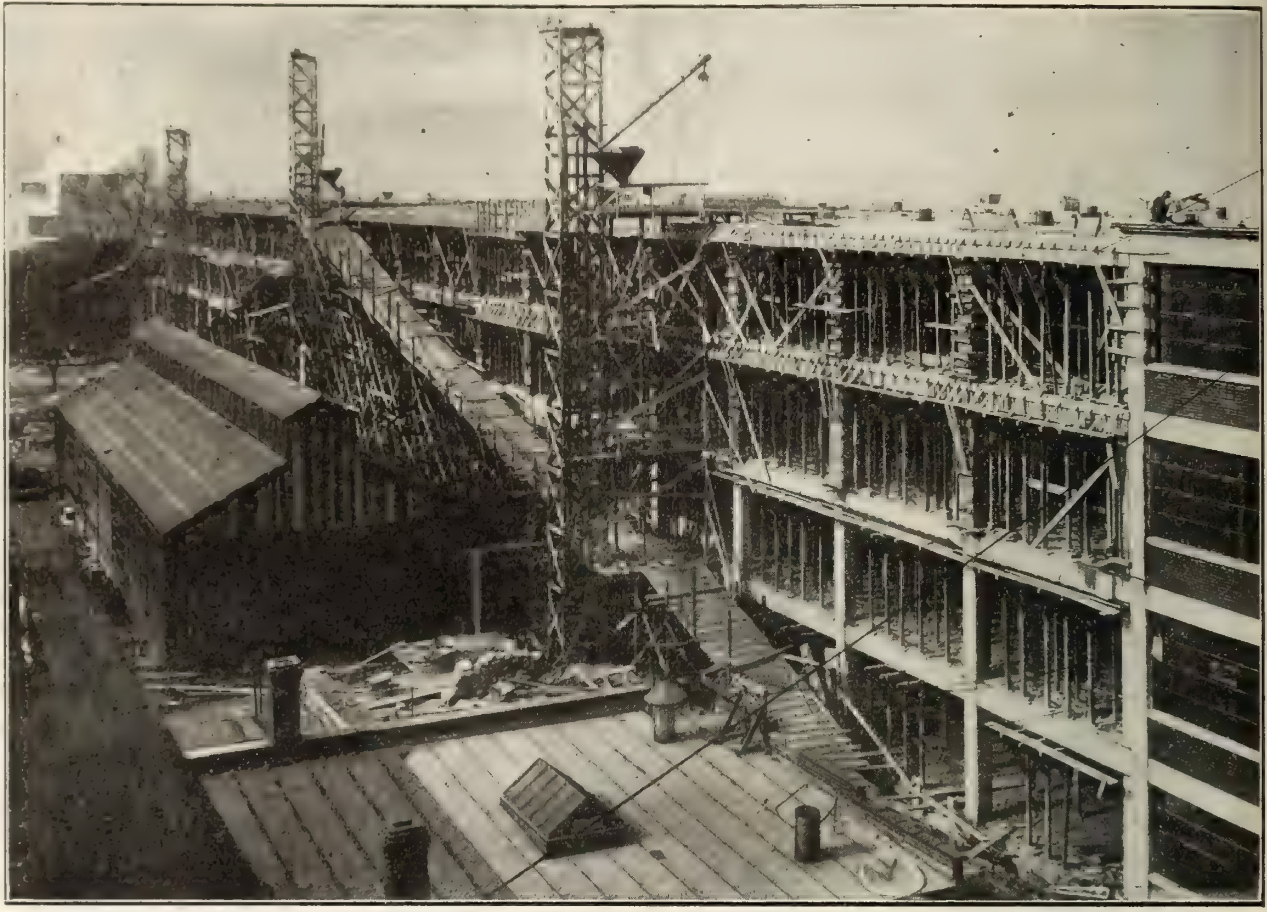


Addition to Ford Motor Co.'s Plant under construction at Walkerville, Ont.

Work started on this job June 20, 1912.

Total of 1858 piles for foundations complete August 22, 1912.

Concrete poured on roof 9 weeks later, October 30, 1912.

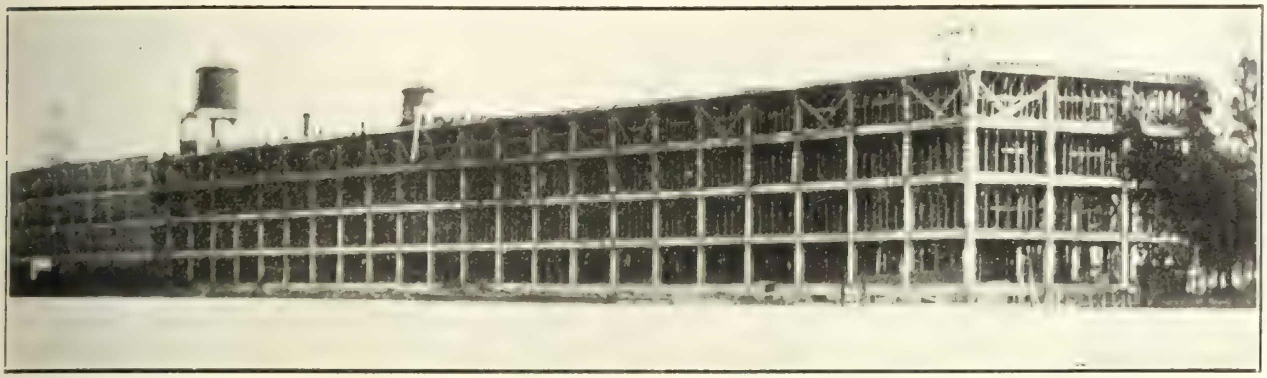
Whole building complete early in December, 1912.

We have sufficient plant to rush the largest jobs to earliest possible completion.

Wells and

Branch Office—
Manning House Building
Windsor, Ont.

Engineers and



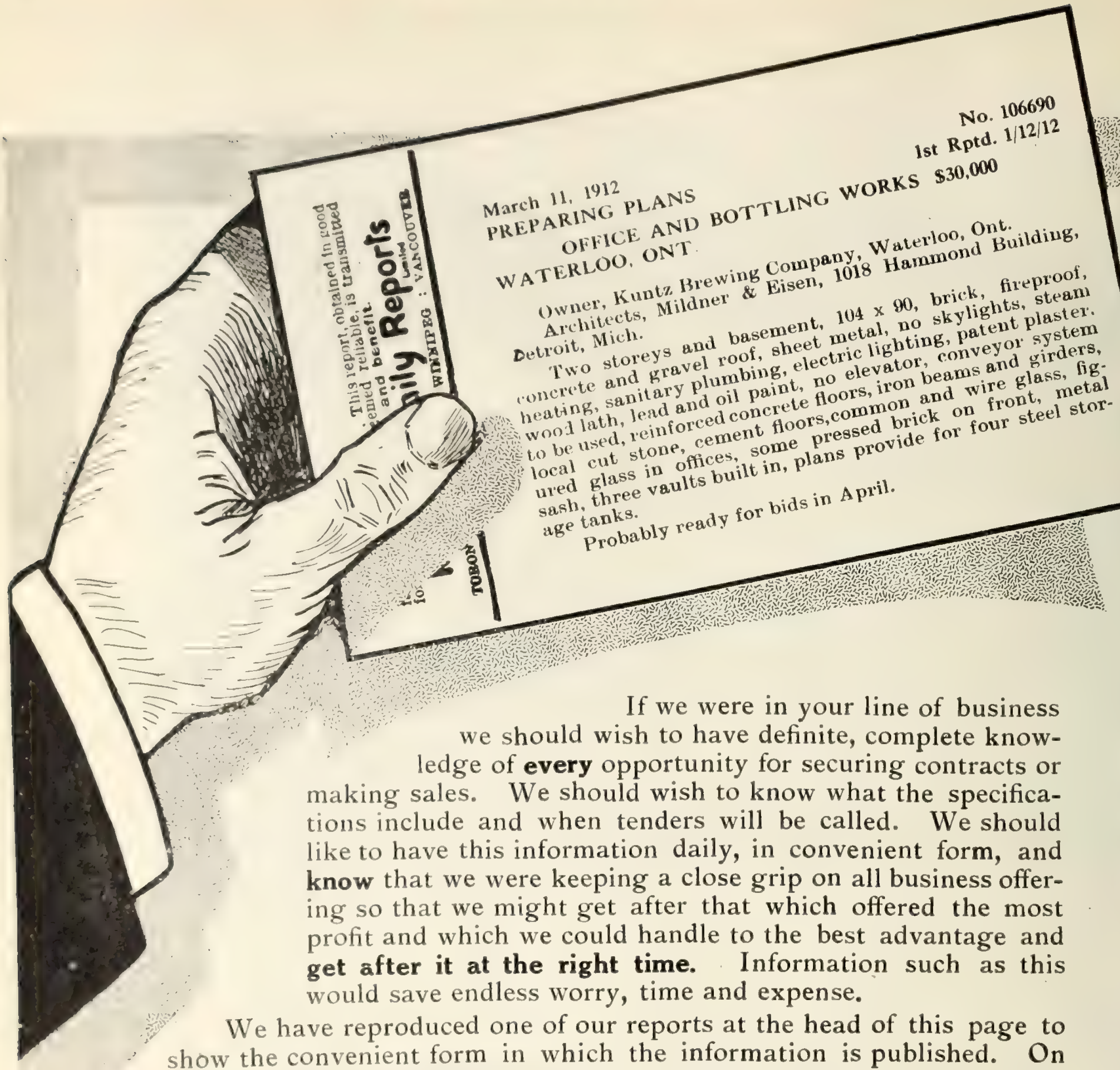
View of Ford Motor Building taken from Detroit River

This building 707 feet long, 75 feet wide and four storeys in height is built out over the Detroit River and is carried entirely on piles. The building is heated by hot air forced by fans through ducts on roof and down to each floor through hollow reinforced concrete columns, all space taken up by steam pipes is saved, no heating apparatus is in view and a large saving was made in heating installation, all these features required special designs involving original engineering ideas. We make a specialty of the design and construction of up to date buildings and our experience in this line has in many cases enabled us to make large savings for the owners.

Gray Limited

Contractors

247 Confederation Life Bldg.,
Toronto, Ont.



No. 106690
1st Rptd. 1/12/12

March 11, 1912
PREPARING PLANS
OFFICE AND BOTTLING WORKS $30,000
WATERLOO, ONT.

Owner, Kuntz Brewing Company, Waterloo, Ont. Architects, Mildner & Eisen, 1018 Hammond Building, Detroit, Mich.

Two storeys and basement, 104 x 90, brick, fireproof, concrete and gravel roof, sheet metal, no skylights, steam heating, sanitary plumbing, electric lighting, patent plaster, wood lath, lead and oil paint, no elevator, conveyor system to be used, reinforced concrete floors, iron beams and girders, local cut stone, cement floors, common and wire glass, figured glass in offices, some pressed brick on front, metal sash, three vaults built in, plans provide for four steel storage tanks.

Probably ready for bids in April.

If we were in your line of business we should wish to have definite, complete knowledge of **every** opportunity for securing contracts or making sales. We should wish to know what the specifications include and when tenders will be called. We should like to have this information daily, in convenient form, and **know** that we were keeping a close grip on all business offering so that we might get after that which offered the most profit and which we could handle to the best advantage and **get after it at the right time.** Information such as this would save endless worry, time and expense.

We have reproduced one of our reports at the head of this page to show the convenient form in which the information is published. On the opposite page are listed the various classes of building and engineering projects covered by our service. If you will place a checking mark opposite each item which interests you and the territory you wish covered we will take pleasure in quoting rates for your business and sending sample reports so that you may judge their value.

Our charges are based upon the individual requirements of each firm and vary according to the territory to be covered and the nature of the information to be supplied.

We would like to tell you how we can help you in your business. We have proven the value of our reports over and over again to firms in your line, and we want to prove it to you—we want to tell you about MACLEAN DAILY REPORTS.

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BUILDINGS

ABODES
- Hotels and Restaurants (2)
- Apartments (3)
- Residences costing under $5,000 (4)
- Residences costing over $5,000 (5)
- Residences costing over $10,000 (6)

BANKS (7)
WAREHOUSES (8)
CHURCHES AND SUNDAY SCHOOLS (9)
FIRE STATIONS (10)
BUILDINGS FOR HORSES & LIVE STOCK (11)
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- Barns.
- Driving Sheds.
- Farm Buildings.
- Riding Schools.

EDUCATIONAL BUILDINGS (12)
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- Convents.
- Schools.
- Universities.

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- Greenhouses (14)
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- Park Buildings, Waiting Rooms (15)
- Pavilions, Grand Stands (15)

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- Ore Mills.

MARINE OPERATIONS (40)
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- Docks.
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- [illegible]
- Piers.
- Wharves.
- [illegible]
- [illegible]
- [illegible]

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- Hydro-Electric Plants.
- Electric Systems or Plants.
- Power Houses or Sub-stations.
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- Gas Systems or Plants.
- Steam Power Plants.
- Hydraulic Systems or Plants.
- Central Heating Plants.
- Pipe Lines.

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- Dump Wagons.
- Concrete Mixers.

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- Irrigation.
- Trenching.
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- Disposal of Waste.
- Reclamation.
- Pipe Lines.

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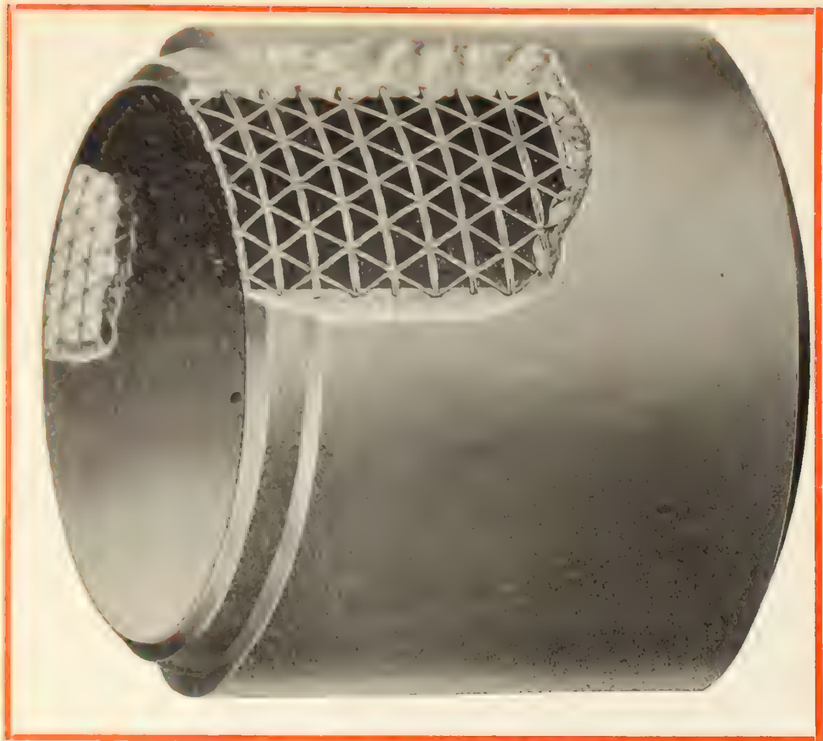
- Poles.
- Wire and Cable Supplies.

WATERWORKS AND SUPPLIES (47)
- Filtration Plants.
- Pumping Stations.
- Waterworks Supplies.
- Pipe Lines.
- Reservoirs.



Concrete

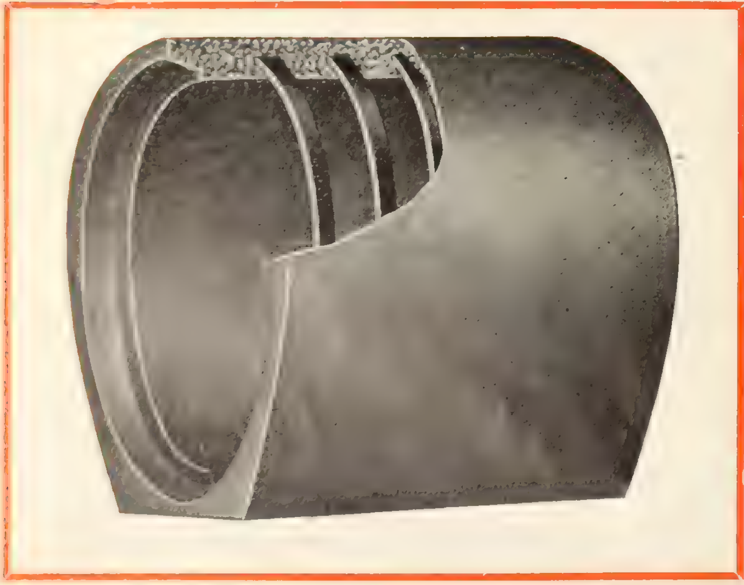
Specially

CONCRETE versus other materials for SEWERS and CULVERTS has ceased to be an argument, and the universal verdict has been given in favor of CONCRETE.

MUNICIPALITIES and RAILROAD COMPANIES the world over have adopted it. Nothing modern and permanent is undertaken without it. Reduced to one word, the sole question to-day is QUALITY.

QUALITY! QUALITY! QUALITY!

The two leading tests of quality are DENSITY and STRENGTH. Our wide experience and the adoption of most scientific methods have enabled us to secure a uniform density which, under test, stands up to a hydraulic pressure of 40 pounds to the square inch without even sweating.



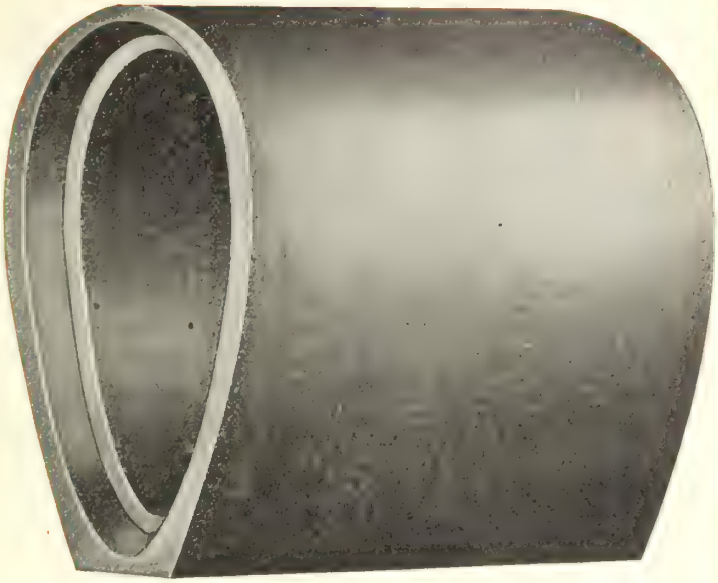
Dominion

Company

Kemptville

Sewer Pipe

Reinforced



Likewise in compressive strength we have secured results far above the average requirements. Single sections of our pipe, in 2½ foot lengths, under official tests have repeatedly carried loads of 26,000 pounds without breaking, even with the section set up on skids and the whole weight applied on an inch-square horizontal bar.

These results in DENSITY and STRENGTH leave a margin of safety far in excess of normal requirements.

We have the largest stock in Canada.

Our pipe is in use from the Atlantic to beyond the head of the Great Lakes.

For special orders we will use any reinforcement an Engineer specifies.

We can make prompt deliveries from mature stock.

We protect our customers against loss by breakage in transit.

We have the best pipe on the market, and at the lowest price consistent with quality.

And when you investigate our material, methods, results and prices, you will buy your requirements from us.

Concrete

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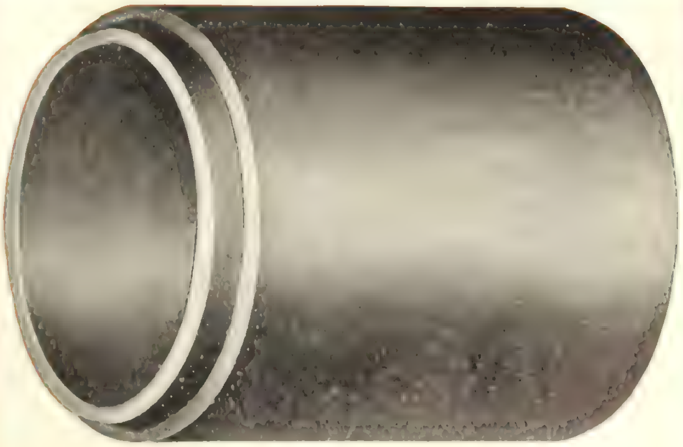

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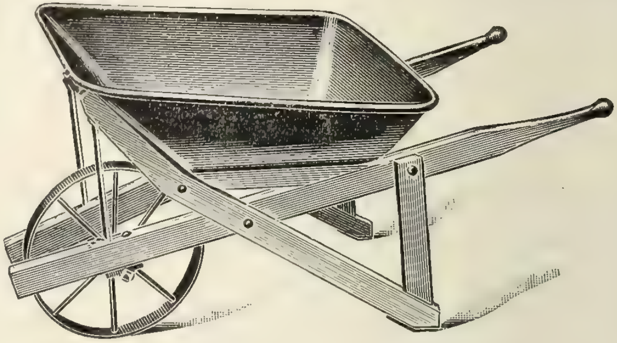

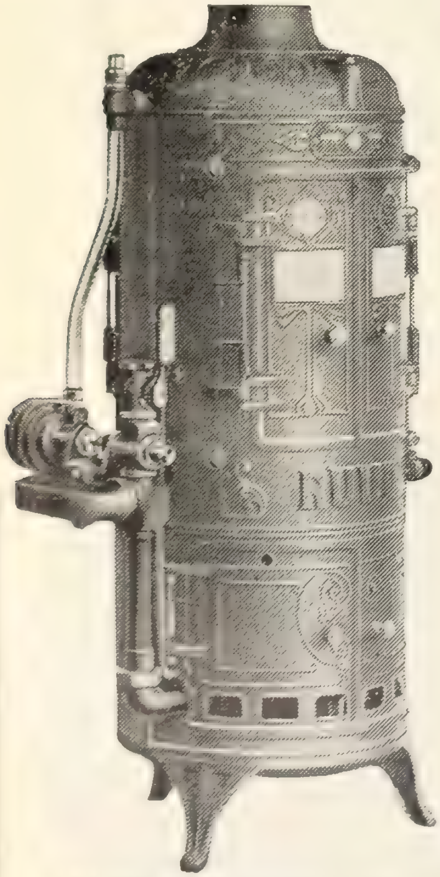

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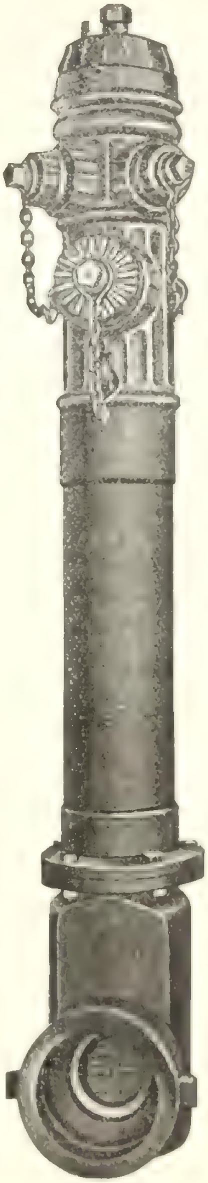

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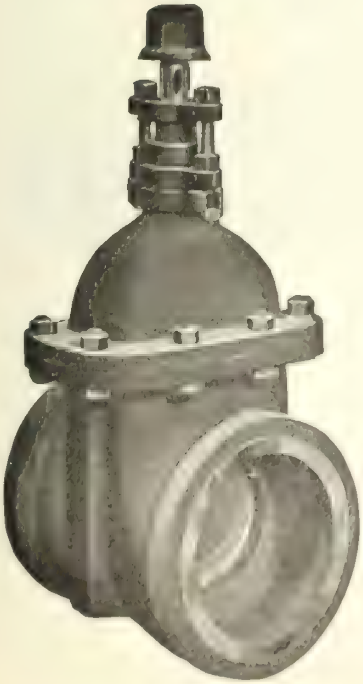

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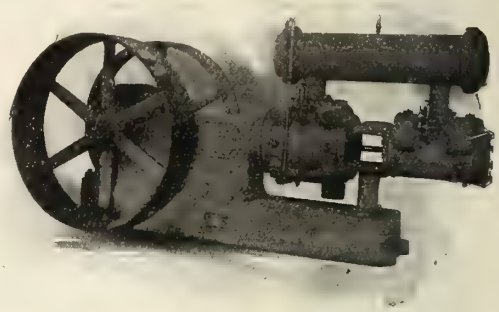
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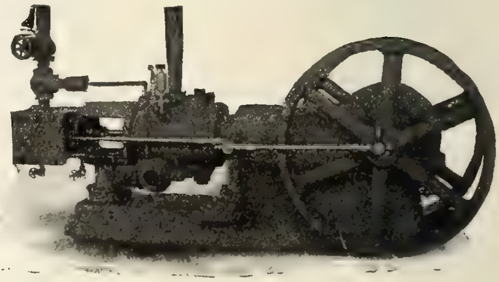
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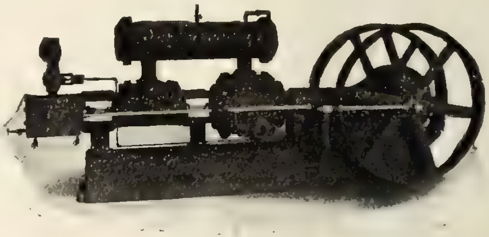
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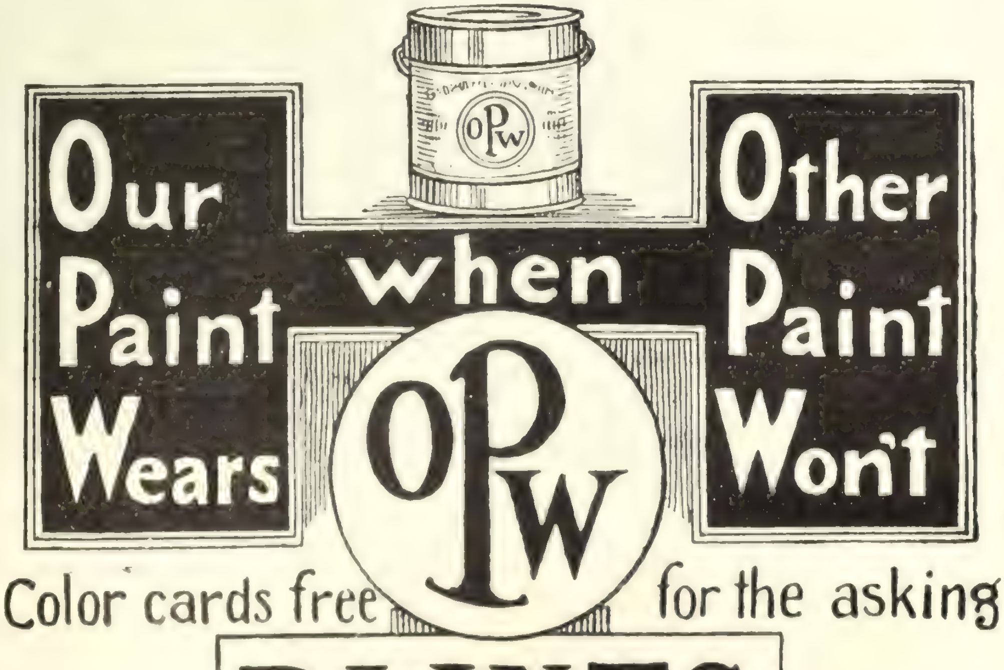

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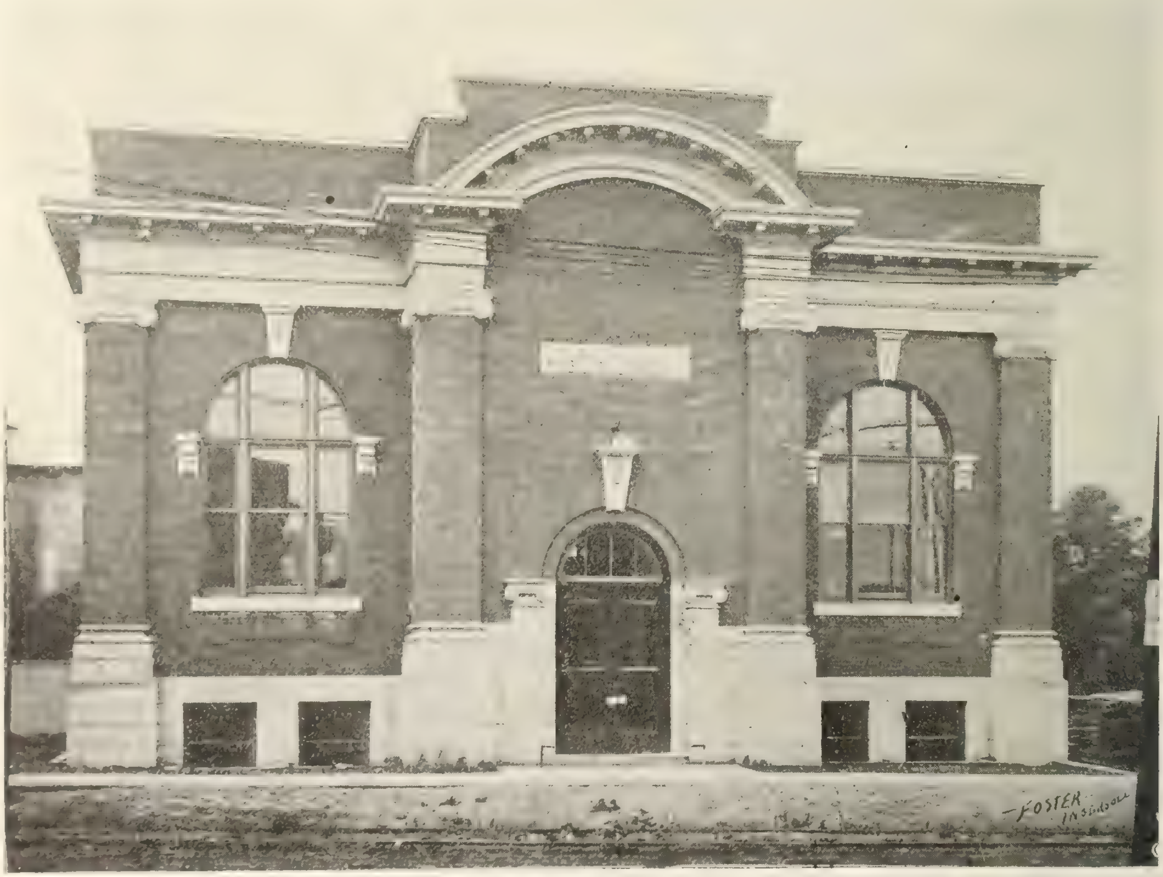

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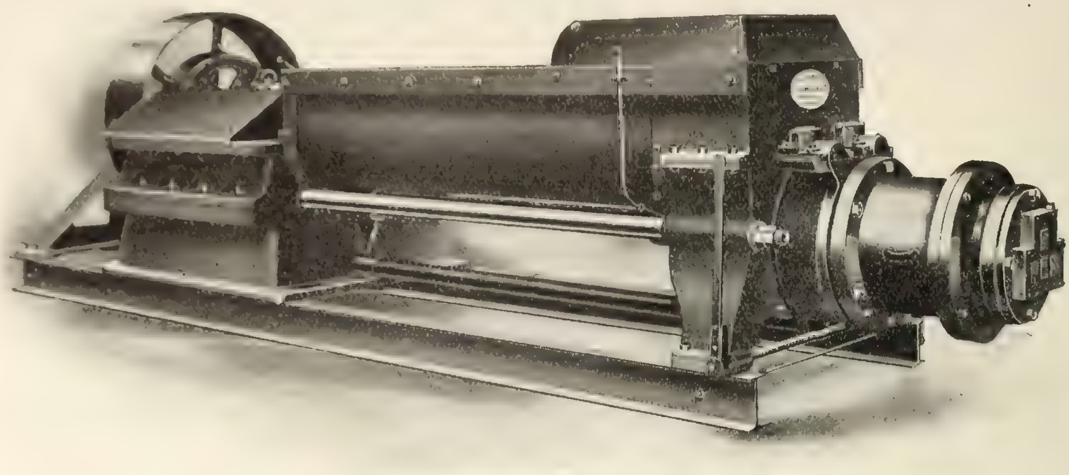

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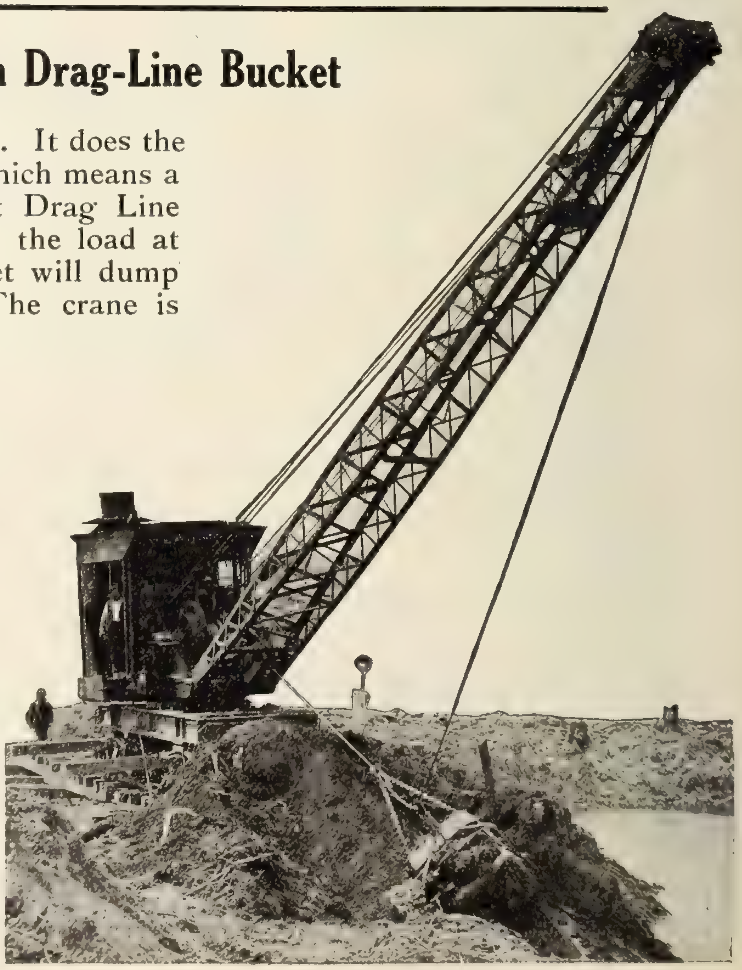

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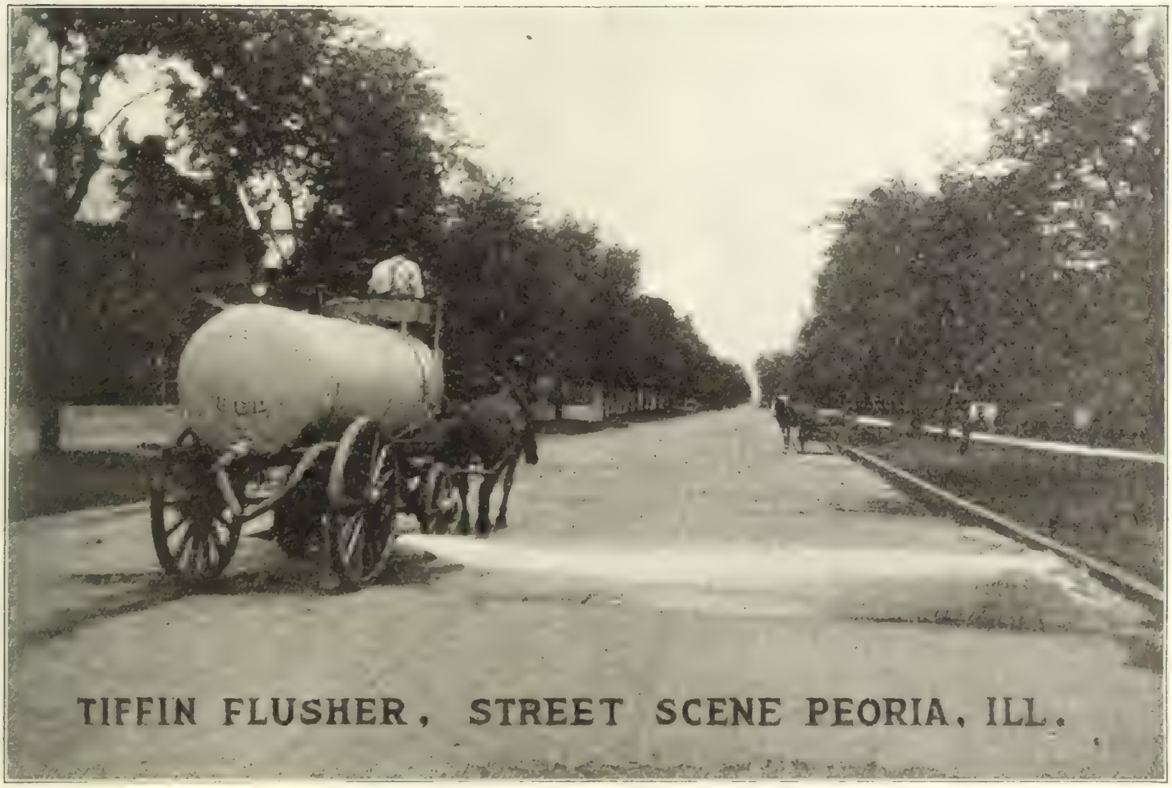

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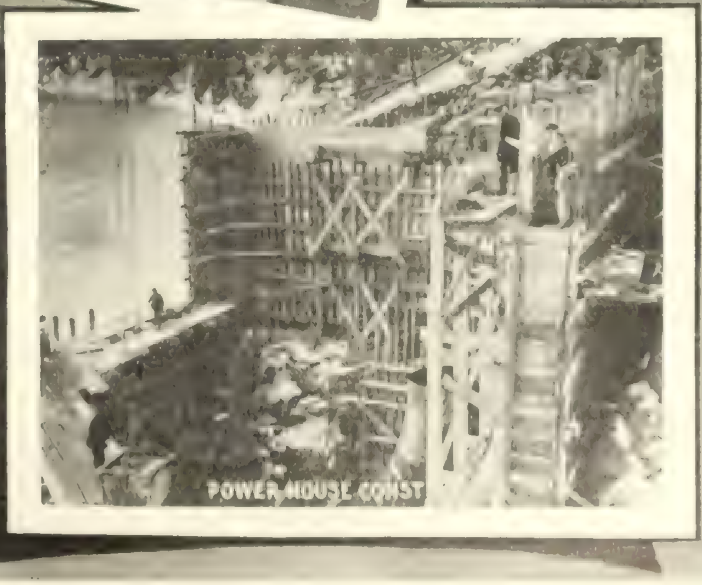

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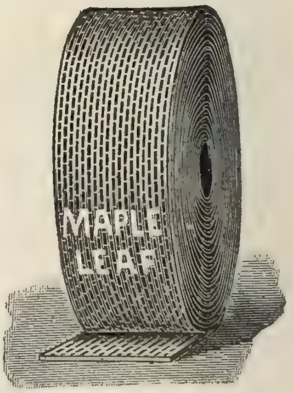

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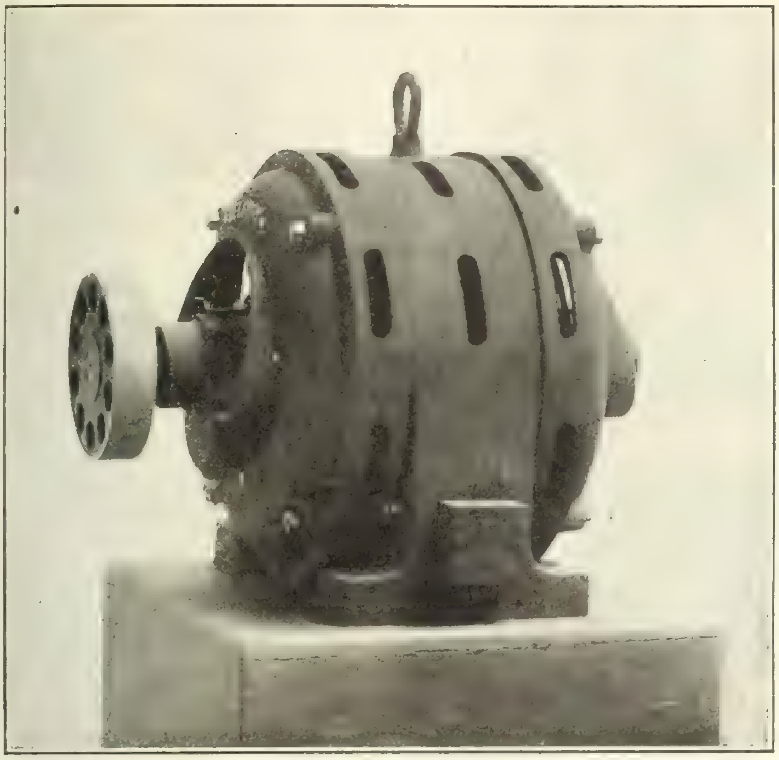

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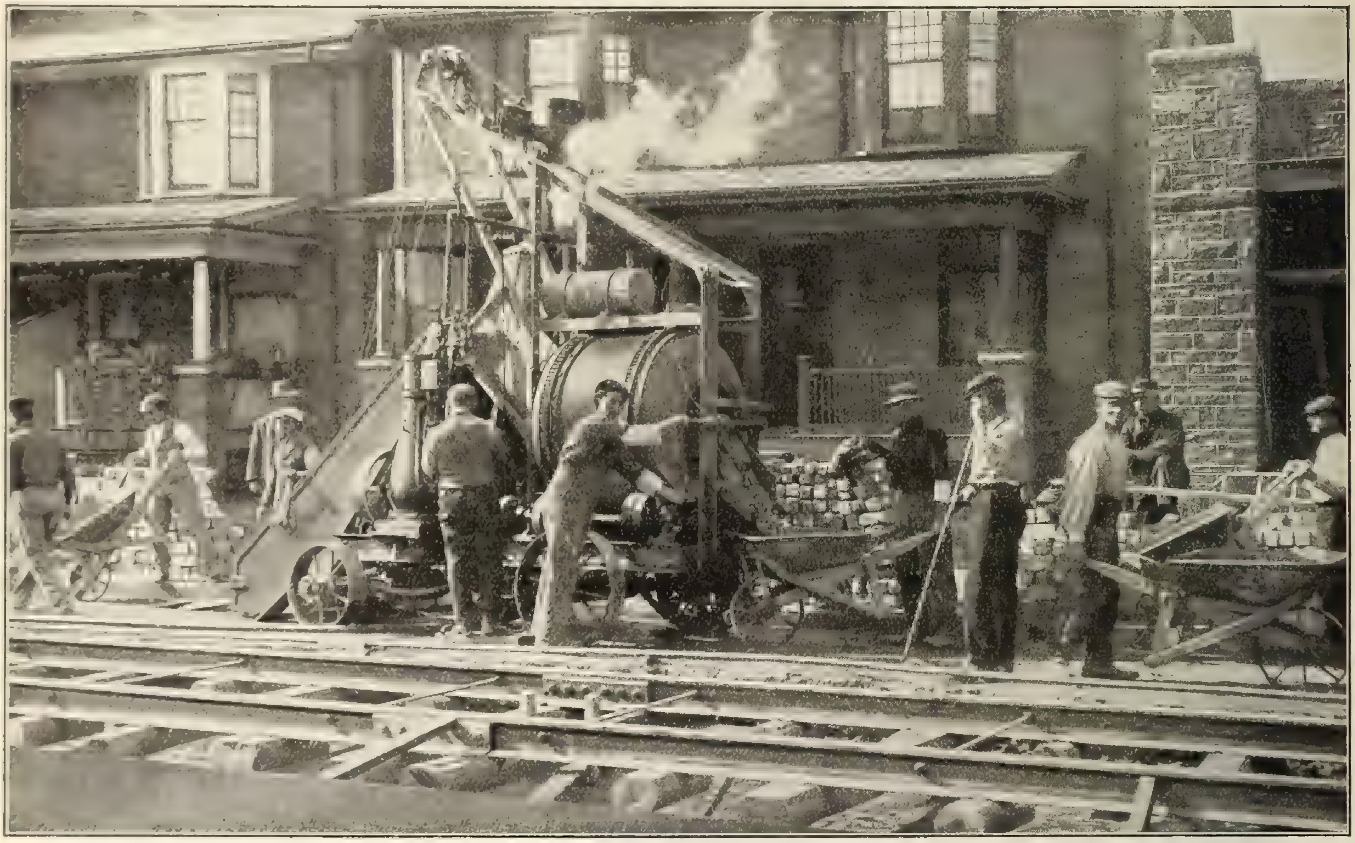

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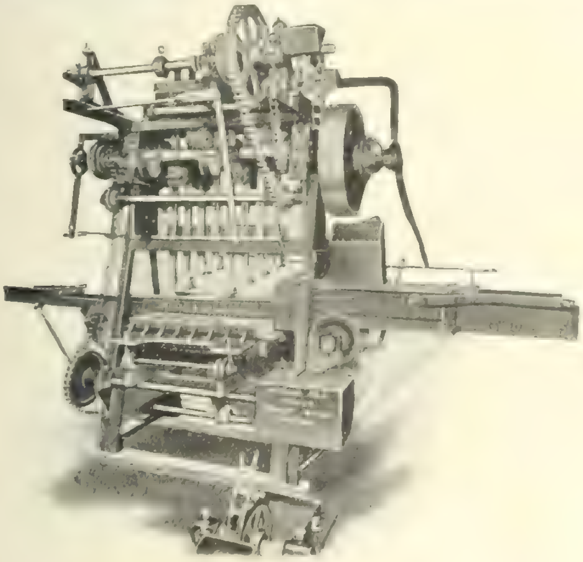
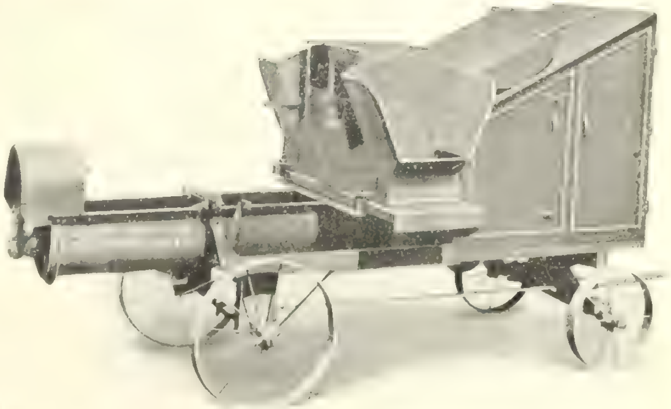


Besser Power Cement Brick Machine

Woodstock Wind-Motor Co., Ltd.
WOODSTOCK, ONTARIO



Besser Simplified Continuous Mixer

Sole Canadian Agents:
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HALIFAX, N. S. " " " "

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Lap Welded Steel Pipe

We carry in stock
30 INCH DIAMETER
LAP WELDED STEEL PIPE

Ask for Prices

International Marine Signal Co. Limited
Ottawa, Canada

ALEX. BRUCE & CO.

Timber Preservers and Fireproofers

Fort Frances, Ont.

Sole owners of the B. M. patent process of lumber preserving.

British Method Best Method

THE DOMINION WOOD PIPE COMPANY LIMITED

NEW WESTMINSTER, B.C.

MANUFACTURERS OF

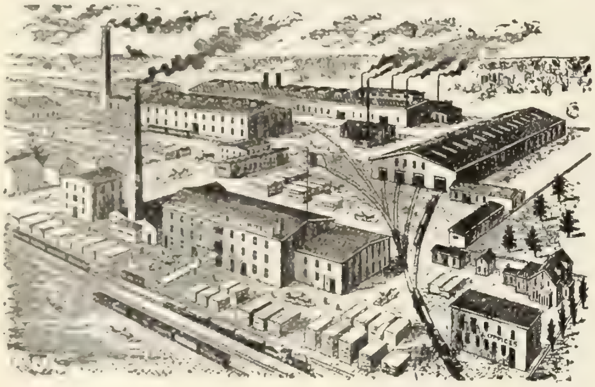
DOUBLE WIRE WOUND

AND

CAST IRON SPECIALS, VALVES, HYDRANTS, ETC.

Rhodes, Curry Co., Limited

Lessees



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SCHOOL DESKS A SPECIALTY

We manufacture all kinds of building materials, including cast iron columns, cresting, sash weights, etc.

In addition to our large stock of native lumber, we are now carrying about one million feet of foreign lumber, including oak, walnut, ebony, whitewood, basswood, red cedar, Douglas fir, mahogany, &c.

Rhodes, Curry Co., Ltd. Amherst, N. S.

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Our Motto "Quality"

High Grade Tile Work

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No job too large or too small
We take them as they come.
Send in your specifications.
Estimates cheerfully submitted.

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Mantels, Grates, Tiles Fireplace Furnishings, Gas and Electric Fixtures.

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For VENTILATING and COOLING

The design of our Propeller Fans is along the same scientific lines as all our fan product, and that is why Sturtevant Propeller Fans deliver more air for the same size fan and with less power expenditure than any other propeller type made. The construction is particularly strong and durable.

They will quickly change the air in factories, workrooms, kitchens, billiard halls, etc., carrying away the smoke, fumes, hot air, keeping the atmosphere sweet and cool.

The electric fans are equipped with motors wound for either alternating or direct current. *Ask for Bulletin No. 146 Z.*

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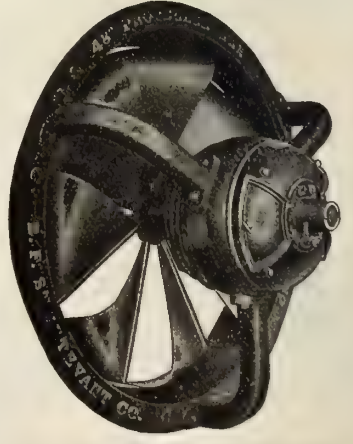
MONTREAL.

Office for Central Canada:
Esplanade East,
TORONTO

Office for Western Canada:
405 Travellers Building,
WINNIPEG



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Cables, "Blizzard, London," A.B.C. Code, 5th Edition
HANLEY, Stoke-on-Trent-England

Glazed and Floor Tiles of Every Description
Terra-Cotta, Quarries "Ironstone-Adamant"

Red Floor Tiles - Best and Cheapest on the Market

Western Canada Provides a Rich Market

for building, construction and engineering supplies of all kinds. The WESTERN CANADA CONTRACTOR is the only publication west of the Great Lakes devoted to the interests of architects, engineers, contractors, builders, etc.

For rates and other particulars, write

Western Canada Contractor
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"Hammer Brand"
Hard Wall Plaster

HARD-WALL PLASTER
HAMMER
BRAND
HILLSBOROUGH, N.B.

It neither loosens nor falls off, it allows carpenters to follow plasterers without loss of time and lasts as long as the building.

Albert Manufacturing Co.
Hillsborough, New Brunswick, Canada

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House Numbers and numbers suitable for Hotels, Apartment Houses, Church Pews, etc.

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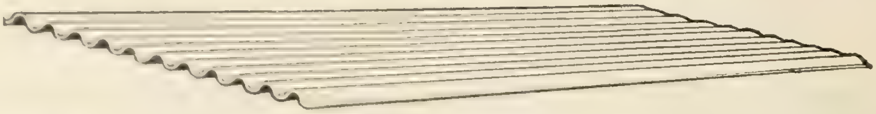
Asbestos Corrugated Sheathing



Lessens Depreciation

The sum which must annually be spent on upkeep, and written off for depreciation of buildings can be greatly reduced by the use of Asbestos Corrugated Sheathing.

A Mill, Elevator, Freight Shed, Factory or Warehouse roofed and sheathed with this material presents a practically everlasting exterior, proof against fire and the elements.

Made of two indestructible materials, Portland Cement and Asbestos, this sheathing is not subject to rust or decay, and never requires painting or waterproofing. In fact it grows harder and tougher with age and exposure.

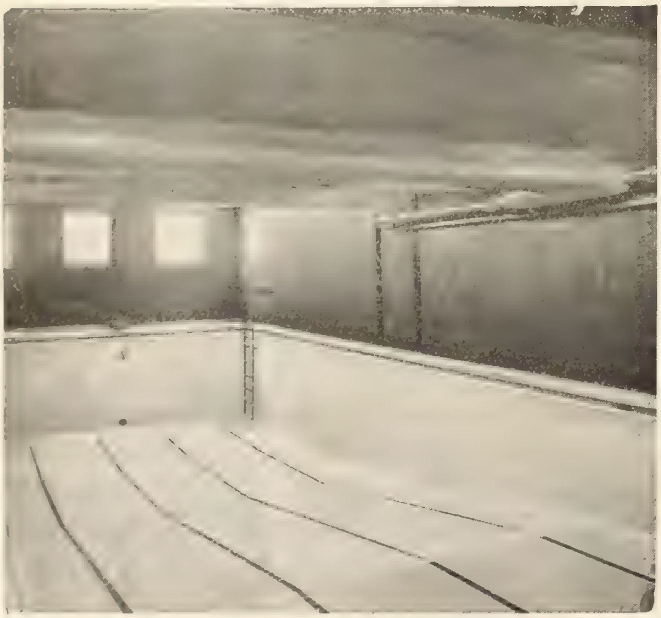
Asbestos Corrugated Sheathing is made in standard lengths of 4, 5, 6, 7, 8, 9 and 10 feet by 27 1/2 inches wide, with corrugations of 2 1/2 inch pitch.

Write for our Booklet No. 9 which shows in detail the methods we have perfected of attaching sheets to wood and steel framing, and of covering ridges and corners.

Asbestos Manufacturing Co., Limited

Address E. T. Bank Building, Montreal

Factory at Lachine, Que.
(near Montreal)



Swimming Pool made Perfectly Waterproof with Ceresit Waterproofing

CERESIT WATERPROOFING CO.

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E. G. Cullen, 418 Pacific Bldg., Vancouver, B. C.
Carritte-Paterson Co.,Ltd., St. John, N.B.
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Ceresit Factories are located in Chicago, Unna, Westphalia, Germany, London, Paris, Vienna, St. Petersburg.

CERESIT was the only Waterproofing that proved satisfactory

Defiance, Ohio, Nov. 25, 1912.
Ceresit Waterproofing Co., Chicago, Ill.

Gentlemen:

In your last letter you asked u to give our opinion of Ceresit. The biggest job was retaining walls for the Defiance Machine Works between the office and canal. They experimented with other waterproofing but Ceresit was the only one that proved satisfactory. We use it also for plastering "Silos," cement cisterns ard numerous other jobs.

Defiance Cement Works,
John Schlembach, Prop.

"Ceresit" Waterproofing is guaranteed to be a uniform permanent water repellant on any sort of concrete construction such as tunnels, reservoirs, dams, foundations, swimming pools, bridges, viaducts, aqueducts, water tanks and towers, walls, cellars, floors, boiler pits or roofs.

Ceresit is sold all over the world in barrels, and five and ten gallon jacketed cans labeled with our name for identification CERESIT is catalogued in "Sweet's" Index. Agents wanted in unoccupied territory.

Please cut this out

REMINDER

to write for Free Book "S" on how to Effectively and Permanently Waterproof Concrete and Cement Mortar.
CERESIT WATERPROOFING CO., Commercial Bank Building, CHICAGO

MILTON PRESSED BRICK

FOR every class of building from the aristocratic little bungalow to the massive office or public building no material is more effective and lasting than Milton Pressed Brick.

These bricks are made in several shades of red and buff from the very finest shale in the world. They are uniform in shape—smooth in texture and possess a pleasing color that is everlasting.

For the best results—specify the best brick.

Milton Pressed Brick Co., Ltd.
MILTON, ONT. TORONTO, ONT.

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1,000,000 MADE AND SOLD IN LESS THAN TWENTY-ONE YEARS—WATCH IT GROW TO 2,000,000

The Millionth Meter

THIS excellent record of 20 years manufacture of Trident meters is convincing evidence of the true merits of these meters.

To sell over one million meters in twenty years required more than mere salesmanship and advertising—more than successful manufacturing—it required the producing of a meter of real intrinsic merit—one that would do all and more than its makers claim for it.

Every part of every Trident meter is interchangeable. We can supply today a replacement part for a meter made in 1893.

"TRIDENT" water meters have "Made Good"
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TRIDENT WATER METERS

OVER ONE MILLION METERS IN LESS THAN TWENTY-ONE YEARS

Made March Fourth

THERE is a Trident meter for every service. A compound meter that will accurately record the smallest trinkle to the largest high pressure stream.

For cold climates there is a disc frost proof meter that cannot be wrecked by freezing.

For the service where trouble is likely there is a split case meter which allows of ready inspection or repair without disturbing the line.

There is a standpipe and water cart meter.

There is a "TRIDENT METER" for every service.
Write for the catalogue that shows the complete line.

Meter Co.

New York

Felt Goods for all Mechanical and Commercial Uses

The Booth Felt Co., Limited

Gananoque, Ontario

MANUFACTURERS

This line includes felt washers, packings, lubricating pads, all kinds of dust and weather proofing strips, insulating materials, noise preventing typewriter pads, felt heel pads for shoes, wicks for fan motors and machinery, buffing and polishing wheels, hand blocks for rubbing and polishing, discs for electric lamp bulbs, felt blue print blankets and a thousand and one other specialties in the line of felt for manufacturers of machinery and mechanical appliances of every description.

If its made of felt ask Booth

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Successors to

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Marbles and Tiles

Foreign and
Domestic Marbles
Wall Tile
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Mosaics
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Marble Mantels

145 Church Street
TORONTO, - ONTARIO

"It Stays Put"

These three words well describe the most important characteristics of Bermudez Road Asphalt.

"It stays put" under hot suns, winter frosts, heavy rains, or extended drought.

"It stays put" in roads like the one shown in the above picture of the heavier traffic road in the State of Massachusetts.

"It stays put" under all kinds of traffic, horse-drawn or motor. The reason why

Bermudez Road Asphalt

"stays put" is that during its tropical formation it became an absolutely stable product. Used as a binder in roads it does not bleed, volatilize, lose its "life" and allow the road to go to pieces.

Highways with stone, gravel, shell, brick, concrete, or any base that provides a stable foundation, may be economically re-surfaced with this material.

Bermudez is used either by penetration or mixing process with stone and by mixing with gravel.

Whatever your particular road problem may be find out how it can be solved by the use of Bermudez Road Asphalt.

Specific information can always be obtained by addressing the Road Department. Ask for copy of Bermudez Road Book.

Road Department
The Barber Asphalt Paving Co.
PHILADELPHIA, PA.

Lay 200 More Bricks Every Day

Hundreds of contractors to-day are laying 200 bricks more every day than they used to because they use

Renfrew Lime

in their mortar. It makes the mortar much easier to handle and it goes farther.

You can save 75 cents a day on every bricklayer by using our lime in your mortar.

Try "RENFREW" on your next job.

White Lime
Gray Lime
Drain Tile
Brick Stone

Jamieson Lime Co.
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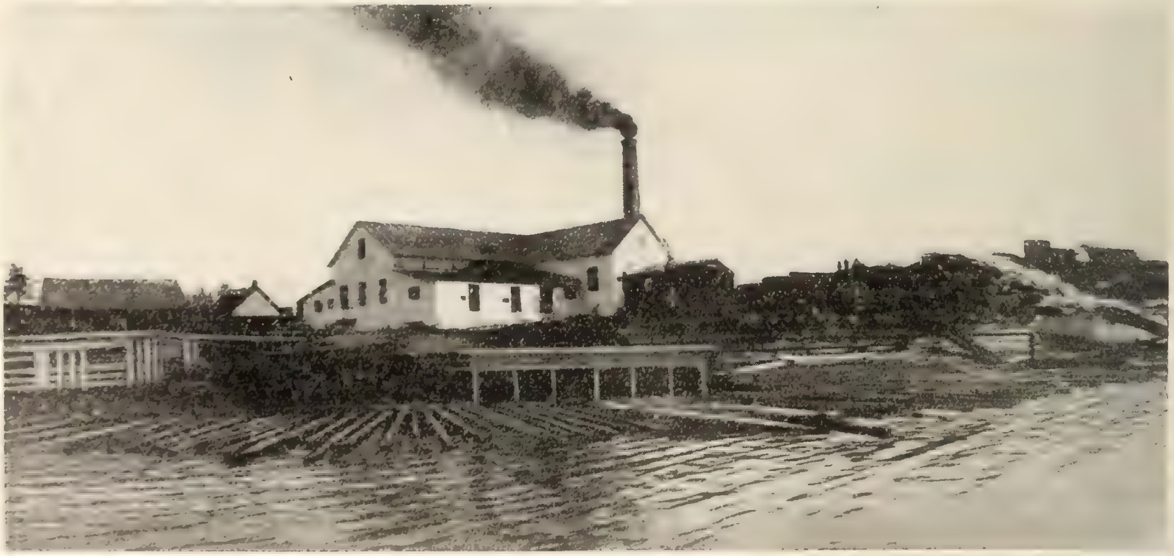
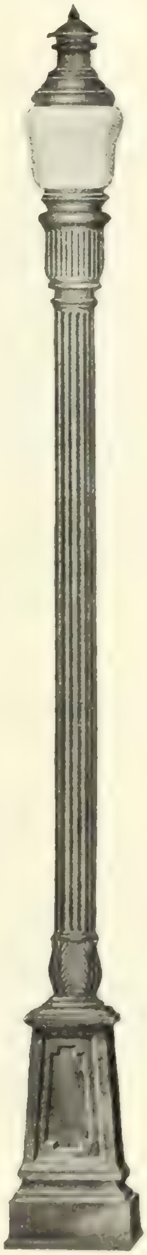


Specifications sawed to order.
Heavy yellow pine and fir timbers on hand.

James Sheppard & Son
Sorel, Quebec

MORRIS
Street Lighting Poles



Modern Ideas in Street Lighting

Send for Descriptive Bulletin and Prices

Canadian Distributors

L. H. Gaudry & Co., Ltd
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QUEBEC, P. Q.

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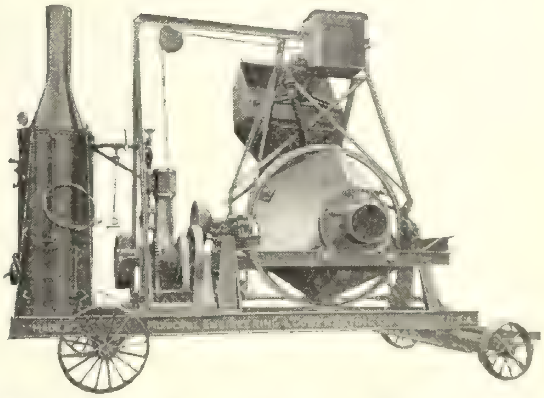
Aull Block
CALGARY, ALTA.

Over 100
Austin Improved
Cube Mixers
on the Panama Canal Work



Why — Do You Suppose?

Because "cube mixed" concrete tested out best in the preliminary trial of mixers conducted by the canal engineers. Because

Austin Improved Cube Mixers

proved that they were able to mix faster—and keep it up. Because there are AUSTIN MIXERS on the Panama Canal work that have records of a quarter million cubic yards of concrete mixed—and they are still doing just as good mixing as ever.
The Panama Canal work is important work; but so is *yours*. That is why you, too, need the AUSTIN IMPROVED CUBE MIXER.

Write for Catalogue No. 8

Municipal Engineering & Contracting Co.

Main Office: Railway Exchange Bldg., Chicago, U. S. A.
Eastern Office: 90 West Street, New York City, U. S. A.

Represented in Eastern Canada by
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Represented in Western Canada by the
CANADIAN EQUIPMENT & SUPPLY CO., Calgary
E. G. CULLEN, Vancouver
Agents wanted in open territory

The Cummer One-Car Asphalt Plant

DIRECT HEAT OR STEAM MELTING

GUARANTEED CAPACITY 2000 yards two-inch top per day.
2500 yards two-inch asphaltic concrete per day.

Everything Large Capacity—All on One Car

Forty-one Plants built during past four years. Sixteen Plants built during 1912. Seven Plants under construction. Prompt delivery assured.

Cummer Semi-Portable Asphalt Plants

Capacity 600 yards to 2000 yards two-inch top per day.

Cummer Mechanical Dryers—for Drying Everything

THE F. D. CUMMER & SON COMPANY
Cleveland, Ohio

McClary's "Algoma" Steel Ranges

Three Sizes, 16, 25, 35 in. Ovens

Write for Catalogues and Prices to Our Nearest Branch

For Coal or Wood. With or without copper tank.

We are headquarters for Ranges and Heaters Built Especially for Contractors and Camp Use.

Also Cooking Utensils of All Descriptions in Copper, Tinned Steel, Tin, Enamel and Aluminium.

McClary's

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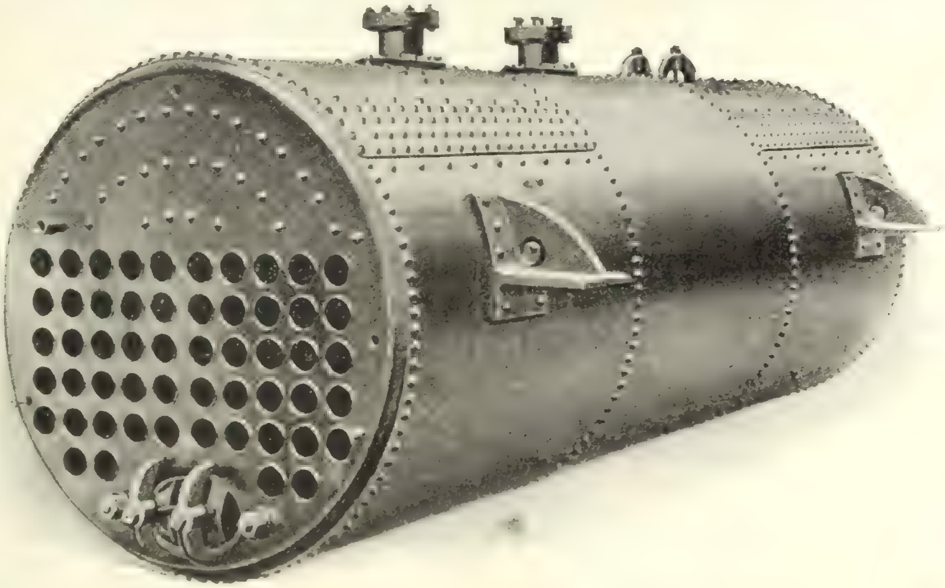
Hamilton Vancouver Calgary Saskatoon Edmonton

Complete Power Plants

BUY
THE
BEST



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PAYS
BIG

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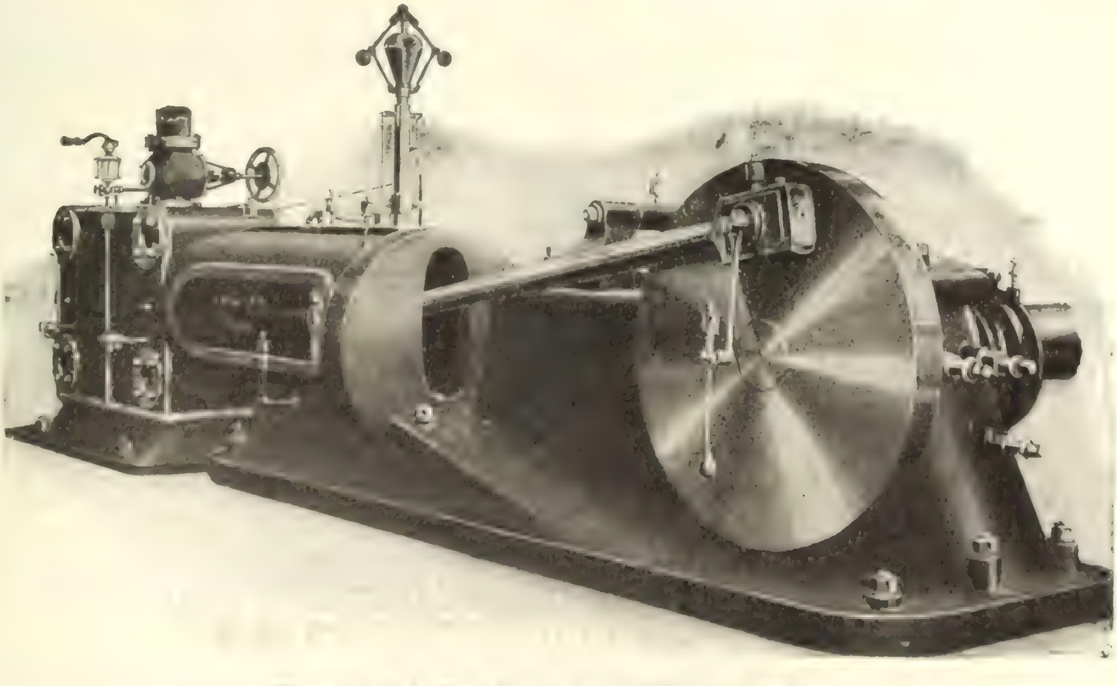
TUBULAR, WATER-TUBE, INTERNAL-FURNACE, FIRE-BOX, VERTICAL



There is Only One Engine and That is The Corliss
There is Only One Corliss and That is the Murray

MURRAY IRON WORKS COMPANY

Incorporated Feb., 1870 43 Years in Business

Burlington, Iowa

IT COSTS NO MORE TO INSTALL GOOD MACHINERY THAN IT DOES POOR

NATIONAL PIPE & FOUNDRY CO., LIMITED

WATER WORKS CONTRACTORS

MANUFACTURERS OF

WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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135 BOARD OF TRADE BUILDING, MONTREAL Works: ALEXANDRIA, ONT.

Wm. P. McNeil & Co.

Limited

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STEEL MERCHANTS

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MANUFACTURERS AND CONTRACTORS FOR

Steel Railway and Highway Bridges, Steel Frame and Mill Buildings, Structural Steel and Plate Work of any description.

Capacity 9000 tons per annum.

Shop is equipped with High Speed Electric Cranes and Modern Heavy Duty Tools, Can handle single pieces structural work of 40 tons.

Large Stock of Beams, Channels, Angles, Tees, Plates, etc., for prompt shipment.

Stock yard runway 800-ft. long, crane 70-ft. span.

Shipping runway 400-feet long, crane 80-ft. span.

Delivery yard runway 120-teet long, cranes 40-ft. span.

Orders and Inquiries Solicited

REMOVAL NOTICE

On the 1st of May the firm of W. J. Hynes Limited will be at home to their friends and the trade in their new location, 718 Dupont Street. This move is made necessary by the increase in the volume of business handled in the last few years. We have been in our old location at 16 Gould Street for 17 years, and thank our friends and patrons for remembering us so kindly in that time. We trust the recollections of our trade relations will bring them to our new location where we have some 30,000 sq. ft. of floor space, giving us the largest plant in our line in the Dominion.

We have our own siding and our shipping facilities are of the very best. Our equipment is such that we can handle your orders with all the speed consistent with good work.

Our line of stock models covering cornices, brackets and corbels, frieze, centers, column and pilaster caps, also all kinds of enrichments is very extensive. We are ready at all times to give you figures on any work requiring special models or estimates of any kind without cost to yourselves.

Remember the New Address

718 Dupont St., Toronto, Ont.

PHONE HILLCREST 1750

The oldest and most extensive mauufacturers of all kinds of Staff and Plaster Ornament, Caen Stone and Keenes Cement cast work in Canada

W. J. Hynes Limited

Take either Bathurst or Dovercourt car line

James Thomson, President. J. G. Allan Vice-President. James A. Thomson, Secretary.

THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.

LIMITED

Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

HAMILTON, ONT.

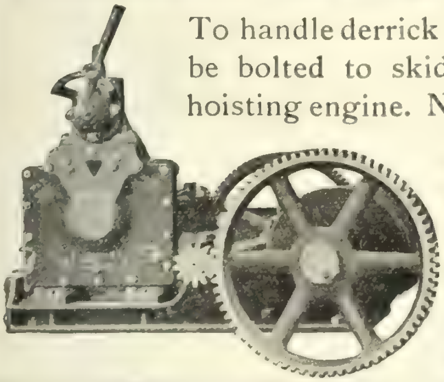
The Canada Iron Corporation, Limited

Head Office:
Mark Fisher Building
MONTREAL

Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear

To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.



Start, Stop, Reverse at Will

WRITE FOR CATALOGUE CR.

Dake Engine Co.
Grand Haven, Mich.

When you want stone that appeals specify

"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
ST. DAVIDS, ONT.

ROCALITE

The Ready Mixed
Hard Wall Plaster

Manufactured by

Alex. Bremner
Limited
100 Bleury Street - - MONTREAL

"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

NOTICE TO OUR CUSTOMERS

¶ Please take note that from 1st of May next our mills and Head office will be located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

Lyster Wood Box Turning Enamelling Company, Limited
LYSTER

Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.

MATAWAN TILE CO.

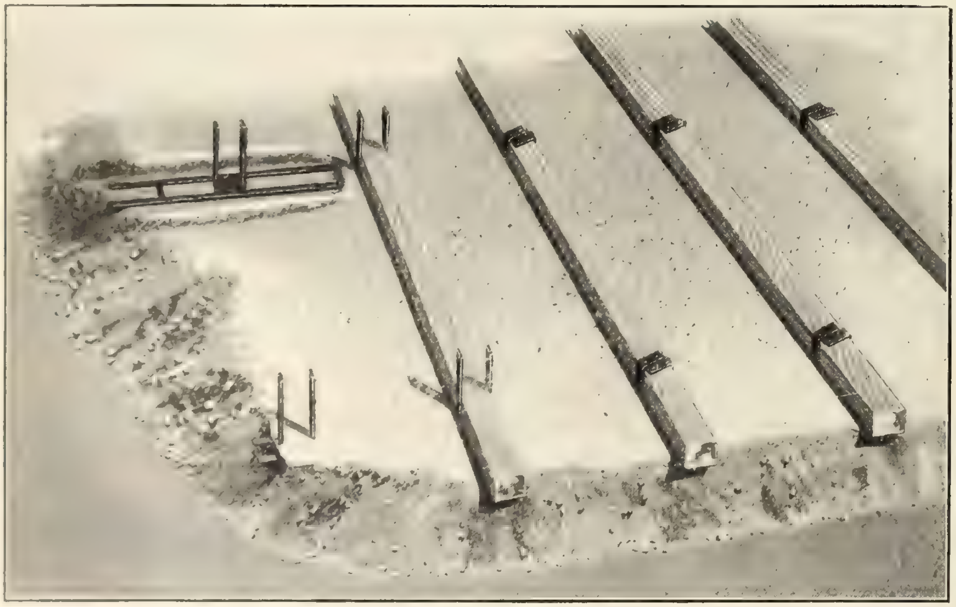
Manufacturers of

CERAMIC, MOSAIC, VITREOUS
AND ENCAUSTIC FLOOR . .
WHITE WALL AND TRIM . .

TILE

FACTORY AND OFFICE

MATAWAN, NEW JERSEY, U.S.A.



Patented in Canada, 1910

Time and Money Saved

"Grip Tight" Floor Sleeper Anchors, the new method of anchoring wood sleepers to concrete, save time and expense

BECAUSE:—

(1) They prevent loose sleepers
(2) They eliminate cinder filling.
(3) Without a filler there is an air space which prevents dry rot to the sleeper and floor.
(4) There is no occasion to introduce moisture into the building after the carpentry work has commenced.

The time and expense ordinarily required in cinder filling, waiting for the building to dry, and bevelling sleepers is easily cut down. "Grip Tight" Anchors are supplied in lengths of eight to twelve feet long and are made from iron heavily coated with noncorrosive paint.

The anchor strips are embedded one to two inches in the concrete slab as it is being poured. The anchors are self spacing and when started in line with the wall at one side, all sleepers are bound to come in perfect alignment.

WRITE FOR INTERESTING CIRCULAR AND PRICES.

The Steel Floor Sleeper Anchor Co., Toronto, Ont.

PROMPT DELIVERIES

Wholesale and Retail

Cement
Crushe Stone
Building Stone
Fire Brick
Sewer Pipe
Gray Lime
Hydrated Lime
Brick
Plaster
Weeping Tile
Mortar Colors

SMYTH & RYAN

Toronto Agents for

Owen Sound and St. Marys Crushed Stone
Deliveries G. T. R. and C. P. R.

Office, 1327 Bloor St. W.
Phones, Junc. 828, 829.

Branch Yard, 53 Merton St., Phone North 4751. G. T. R. Belt Line.

Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	27 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving	36 00	40 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	27 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8 in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 75
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	25
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
85	5 30	8 25
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent.; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock .... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 60 per cent.

Lead Pipe

Lead pipe, $7.50 net, less 10 per cent.; lead waste, $9.00 net, less 10 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 30 per cent.; pig lead, 6½c. lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.04	¼ inch	$2.86
⅜ "	2.04	⅜ "	2.86
½ "	2.72	½ "	3.57
¾ "	3.16	¾ "	4.31
1 "	4.54	1 "	6.19
1¼ "	6.19	1¼ "	8.44
1½ "	7.43	1½ "	10.13
2 "	9.90	2 "	13.50
2½ "	15.80	2½ "	21.56
3 "	20.75	3 "	28.31

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

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Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a yard, f.o.b. Toronto siding.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 61c. per gal. of 9 lbs.

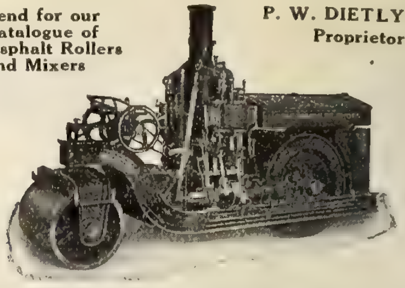
Raw Linseed Oil, in bbls., 58c. per gal. of 9 lbs.

Turpentine, in barrels, 66c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.



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Practical House Framing, by Albert Fair. Published in 1909 by Industrial Book Company, New York. 108 pages, illustrated. Price 50c.

Hints for Carpenters, by Albert Fair. Published in 1909 by the Industrial Book Company, New York. 144 pages, illustrated. Price 50c.

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Reinforced Concrete, by A. W. Buel. Published in 1906 by the Engineering News Publishing Company, New York. 500 pages, illustrated. Price $1.00.

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A Practical Treatise on the Steel Square, by Fred T. Hodgson. Published in 1904 by Frederick J. Drake & Company, Chicago. 222 pages, illustrated. Price 50c.

Engineering as a Vocation, by Ernest McCullough, C.E. Published in 1911 by David Williams Company, New York. 202 pages. Price 50 cents.

Hydraulic Cement, Its Properties, Testing and Use, by Frederick P. Spalding. Published by John Wiley & Sons, New York. 266 pages, illustrated. Price 50c.

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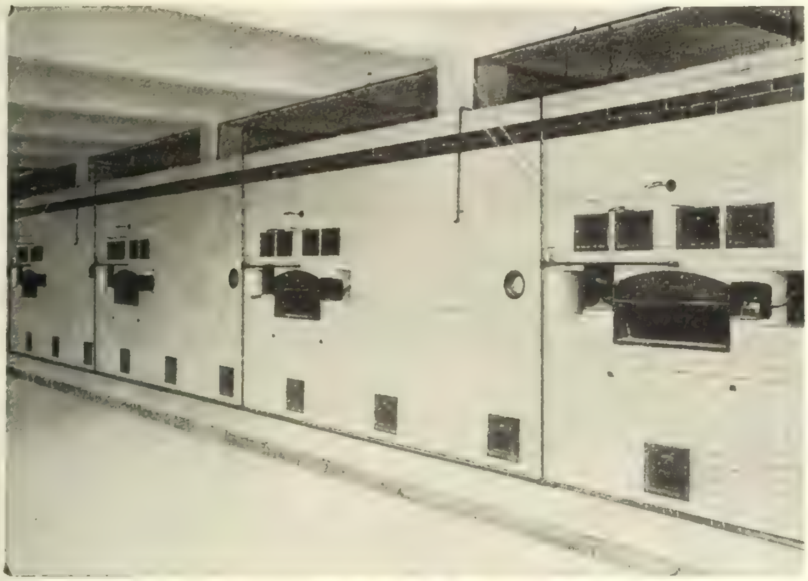

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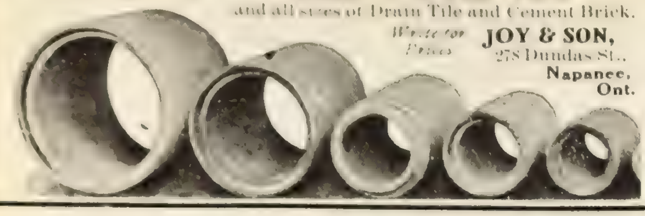

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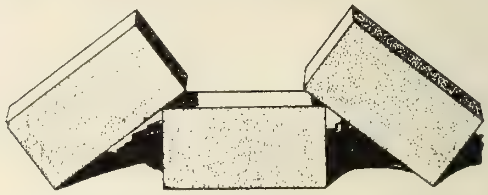

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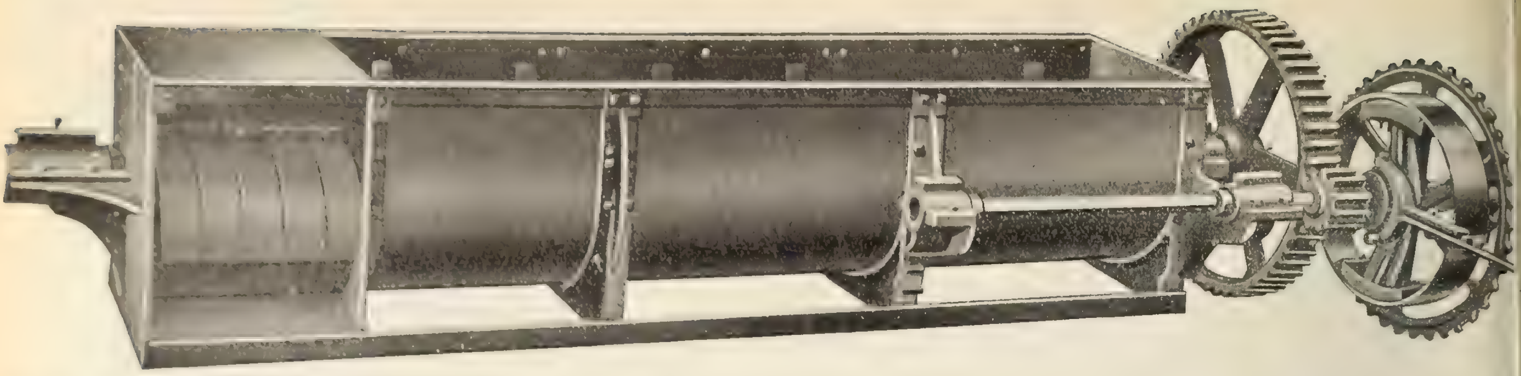

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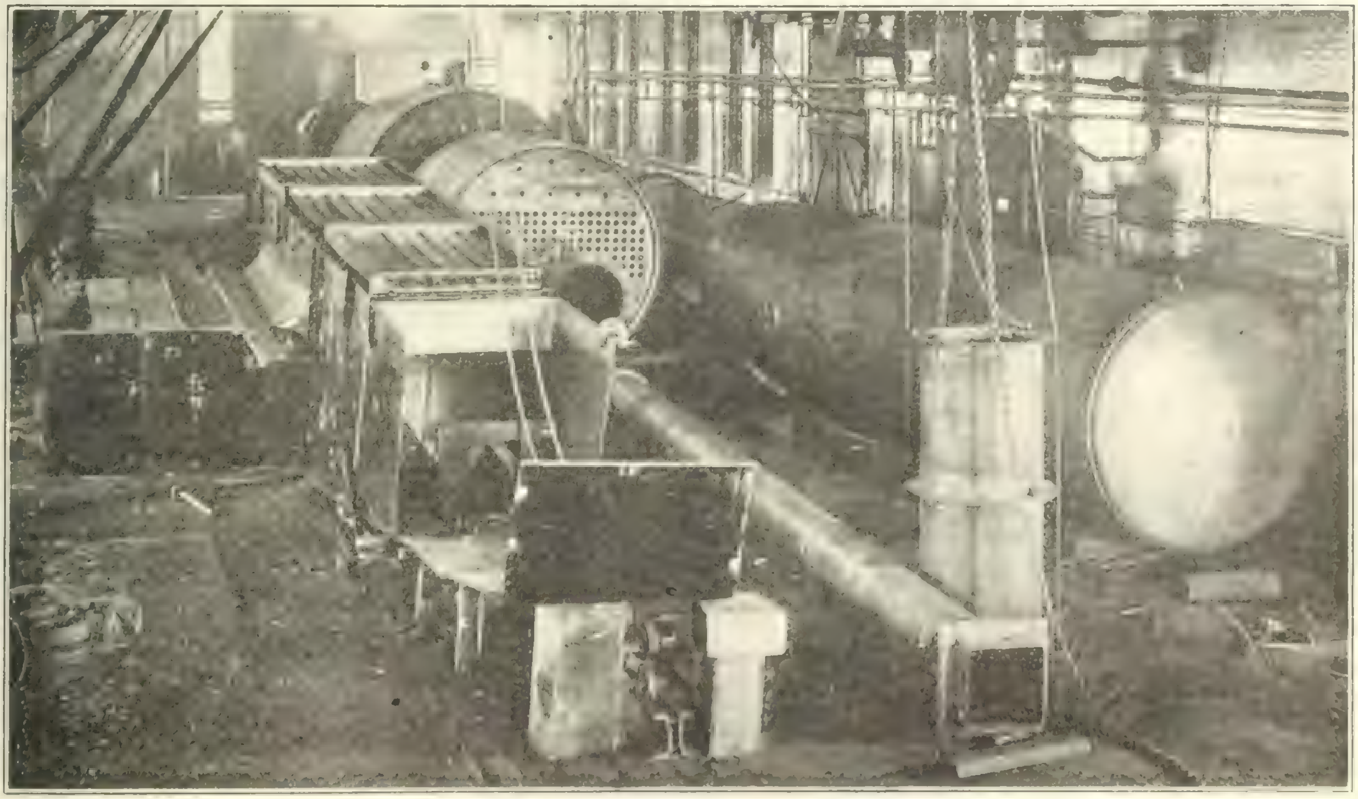

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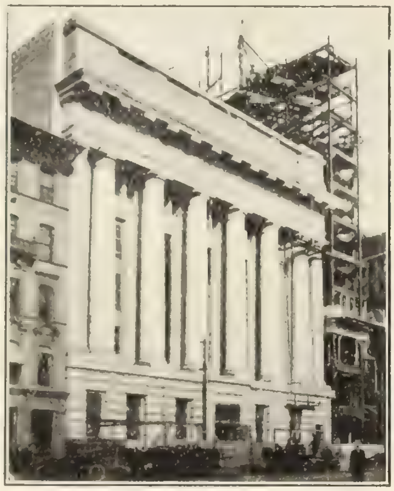

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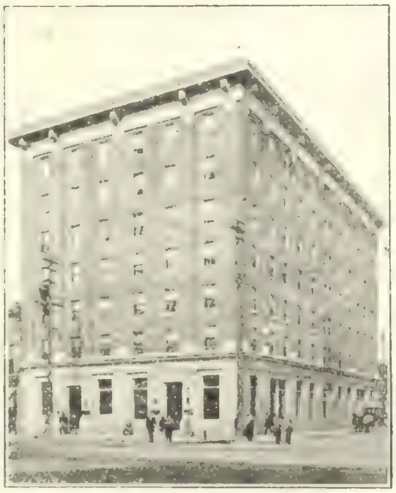

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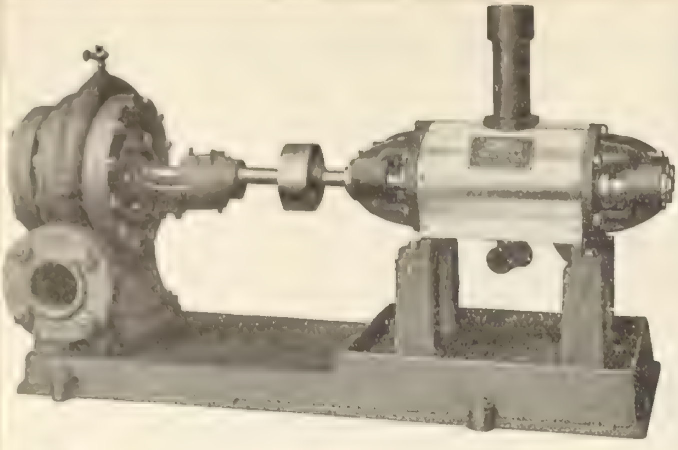

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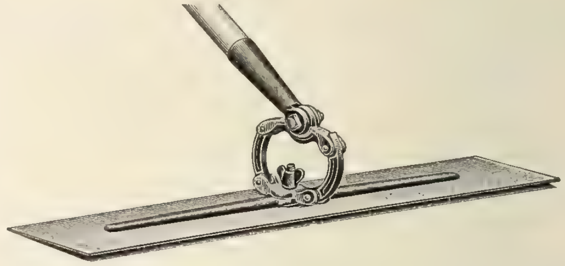

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"Industrial Works" Cranes embody all those features of practical utility which make for the economical solution of lifting and handling problems in the modern industrial plant. From the very smallest to the largest, their lifting capacity, integral strength, rigidity and speed have been proven by actual service tests all over the country.

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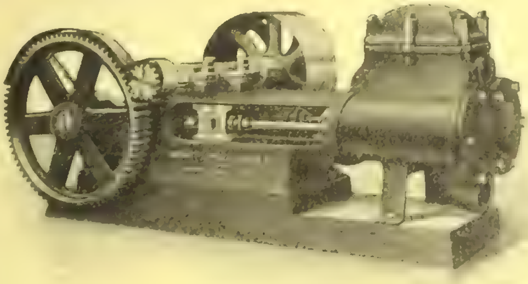
Vol. 27 Toronto, May 7, 1913 No. 19

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps
Condensers, Travelling Cranes



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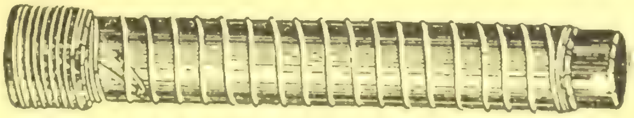

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RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

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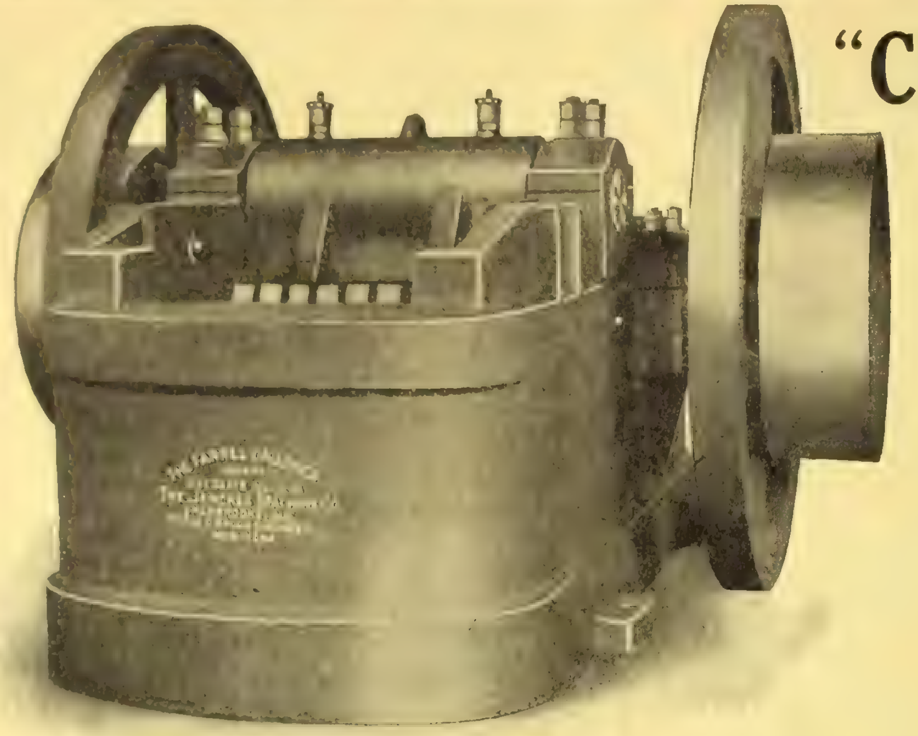
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



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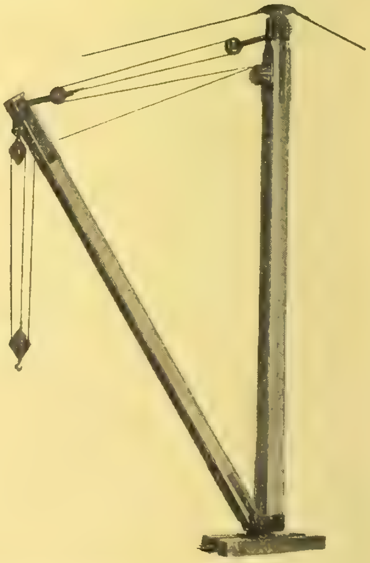
Loaded with DOLLARS is assured to All users of

"American" Derricks



which meet the three principal requirements of modern construction work

Reliability—Rapidity—Economy

There isn't a day that we don't help some contractor to success. May we help you today?

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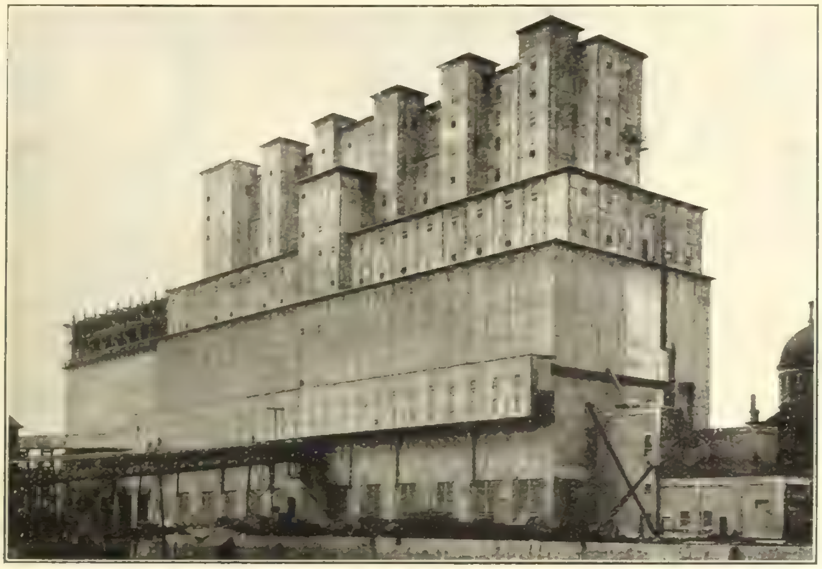

Built of Canada Cement

The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

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On JUNE 12th, 1911, we sold the 3¼ in. Holman Drill shown above. Up to APRIL 23rd 1913, the TOTAL REPAIRS consisted of ONE PAWL and a roll of square Duck Packing. The Drill has been in use NINE HOURS per day, during every working day in the last SIXTEEN MONTHS, drilling on an average NINETY FEET per shift in hard "Banc Rouge."

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You win when you use **Holman Steel Rock Drills** because your

MAINTENANCE COST IS EXCEEDINGLY SMALL
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Made of Dropped Stamped Steel Forgings, and practically unbreakable.

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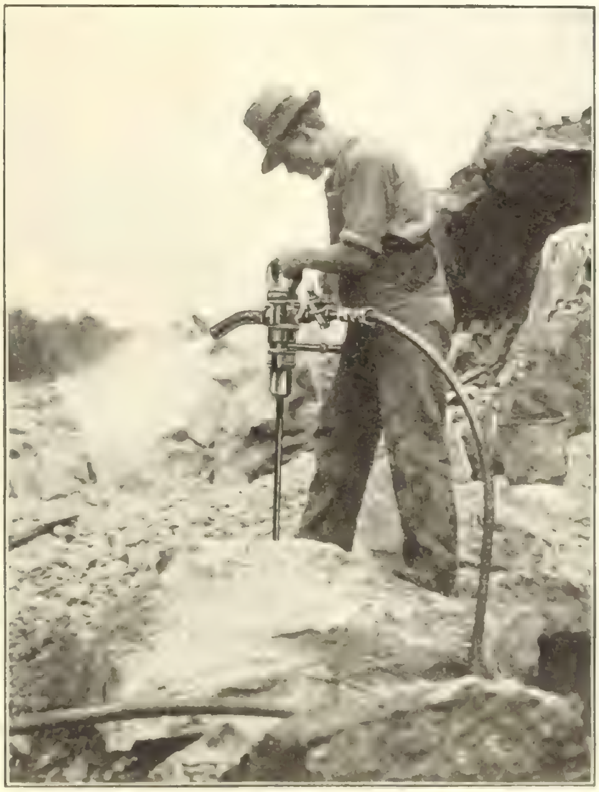
ITS DRILLING SPEED CANNOT BE BEATEN



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One or other of these will take care of your particular work. Tunnel Bars, Automatic Feeds and Dust Allayers supplied where necessary.

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(Continued on page 12)

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For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

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Don Valley Fireproofing, Bricks and Tile used throughout.

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Don Valley Porous Terra Cotta Fireproofing and 2,0000,000 Don Valley Brick used.

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Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

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Don Valley Porous Terra Cotta Fireproofing and Bricks used.

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Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

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"Steelcrete" Concrete Reinforcement

MAXIMUM EFFICIENCY AT MINIMUM COST

Bridge at Campbellford, Ont. "Steelcrete" Floor Reinforcement

One of the more than two hundred highway bridges throughout Canada with Steelcrete Expanded Metal Reinforcing for the floor slabs.

Slabs of concrete reinforced with "Steelcrete" Expanded Metal make a permanent bridge floor of the greatest strength, at the least cost, and with the least amount of superimposed dead load on the bridge. "Steelcrete" possesses an absolutely mechanical bond against vibration. It lies flat. Once placed, disarrangement is impossible. The meshes are diamond shaped, the joints absolutely rigid. There are no corrugated or twisted strands. When the load is applied there is no straightening out to split the concrete before the reinforcement comes into tension.

Specify "Steelcrete" for
Floors, Roofs, Domes,
Tanks, Dams, Piers,
Sidewalks,
Foundations,
Warehouses,
Power Plants

Made in Canada:—Two Factories in Toronto, one in St. Catharines, Ont.

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138 Craig Street West

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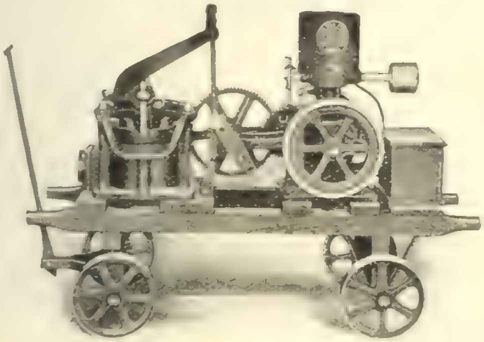
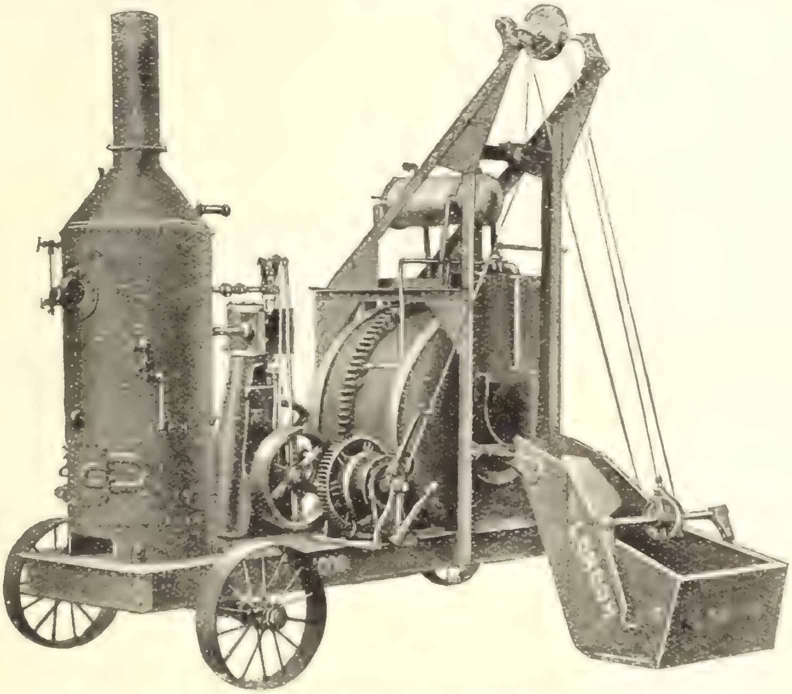
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



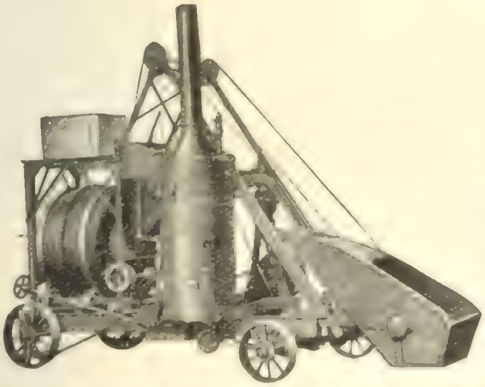
Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



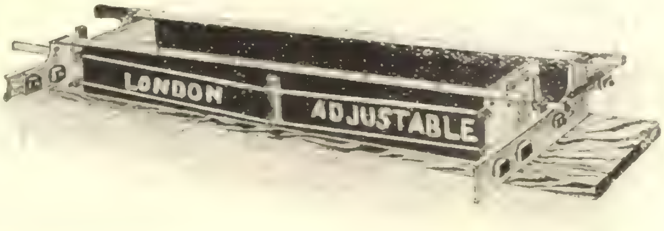
London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.



London Sill Step and Window Cap Mould

A few lines we manufacture –

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines, Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators, Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits.

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

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Wettlaufer Bro's IMPROVED CONCRETE & ROAD MACHINERY

MIXERS

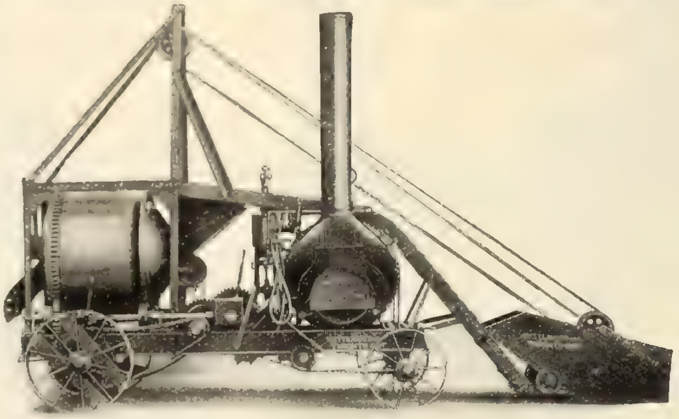
HOISTS

TILE MACHINES

BRICK MACHINES

CRUSHERS

PUMPS



Send for Illustrated Catalogue giving full description of this Mixer.

The Wettlaufer Story

No. 3

Some mixers will stand just so much and then give up—just so many days of steady hard wear and then break down. That's any man's luck, but for genuine downright exasperation give me the mixer that runs an hour and then stops of its own accord for a tap of the hammer or a turn of the wrench. There's lots of that sort around—they'll run a piece and then stop—keep the gang waiting doing nothing till they can be coaxed to go on.

No siree—nothing like that abont my equipment—not since I had my Wettlaufer Heartshape Mixer.

Wettlaufer Heartshape Mixers

will give the highest satisfaction in every day, all day work.

See the new Wettlaufer Heartshape Stationary Drum Traction Mixer with Horizontal Boiler. There are more points of advantage in this Mixer than in any other mixer on the Market.

Come and see it working—Continuous Demonstrations at

Wettlaufer Brothers

178 Spadina, Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

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THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

TO GIVE AMERICAN ENGINEERS AN OFFICIAL STATEMENT OF LONDON'S PAVING EXPERIMENTS

Of All Pavements Tried on the Victoria Embankment, "Trinidad Lake Asphalt Has Undoubtedly Proven the Best"

The Victoria Embankment on the north side of the Thames River in London is a thoroughfare carrying a very heavy traffic on which a variety of pavements have been tried in the last five years. Reference to these trials is frequently made, but there seems to be some difference of opinion concerning the outcome of them. For this reason the following report, issued by the Engineering Department of the London County Council, is here reproduced in order to give American engineers an exact official statement of these extensive paving experiments:

The traffic on the embankment amounts to an average of 10,152 vehicles (excluding tramcars) daily (from 8 a.m. to 8 p.m.) and the average width of the roadway is about 64 ft., including channels, of which, however, 17 ft. is occupied by the tramcar lines. **It is believed that no other road constructed of ordinary macadam carries such a volume of traffic per foot of width.**

[The Report here describes six different pavements laid, beginning in 1905, including 800 yards of Trinidad, and concludes:]

A further trial was given to the Trinidad Lake pavement, the area laid with this material in 1906, and the contract period of maintenance of which expires in this year, **having shown no signs of failure,** and in detached areas some 8,000 sq. yds. were laid down at a cost of $2.17 per square yard, including the cost of maintenance for five years.

1909—**During the last 12 months the deterioration of the tar macadam laid in 1906 and 1907 has gone on at an increasing rate, and it has been found necessary to remove some 3,500 sq. yds. of it and replace it with Trinidad Lake asphalt.** To the Trinidad Lake Asphalt Company was also given during the year further areas (of ordinary macadam) amounting to in all 12,250 sq. yds., to pave at the same price and under the same conditions as before.

It is as yet too soon to speak definitely of the R——— paving, but as regards the other pavements tried **the Trinidad Lake asphalt laid on a binder course has undoubtedly proven the best** under the traffic conditions of the Victoria Embankment. It is much cheaper than the usual asphalt pavements consisting of rock asphalt laid in concrete; its surface appears, so far, to wear equally well, and the substitution of an asphalt binder course under the hard asphalt top coating instead of the usual concrete bed appears to some extent to reduce the noise of traffic.—**From the Engineering Record.**

Send for Complete Copy of Above Report

Is *your city* taking advantage of the fact that a Trinidad Lake sheet asphalt pavement can now be laid at less cost than the best types of stone, wood or any other form of pavement capable of resisting equally heavy traffic?

The Barber Asphalt Paving Co., Philadelphia, Penn.

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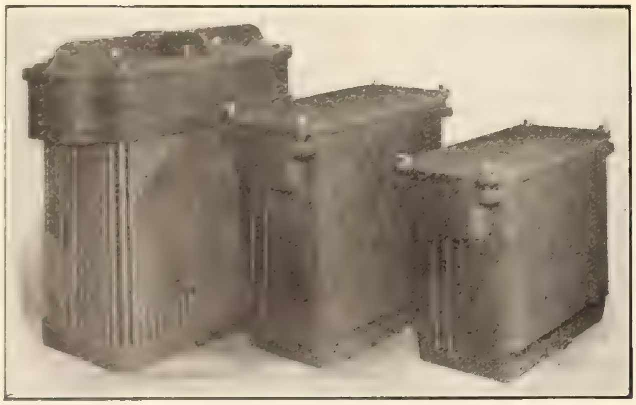

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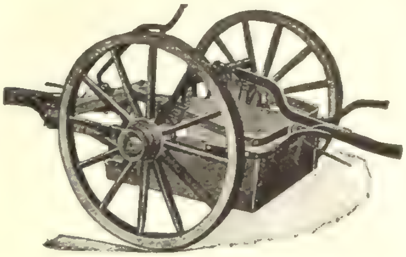

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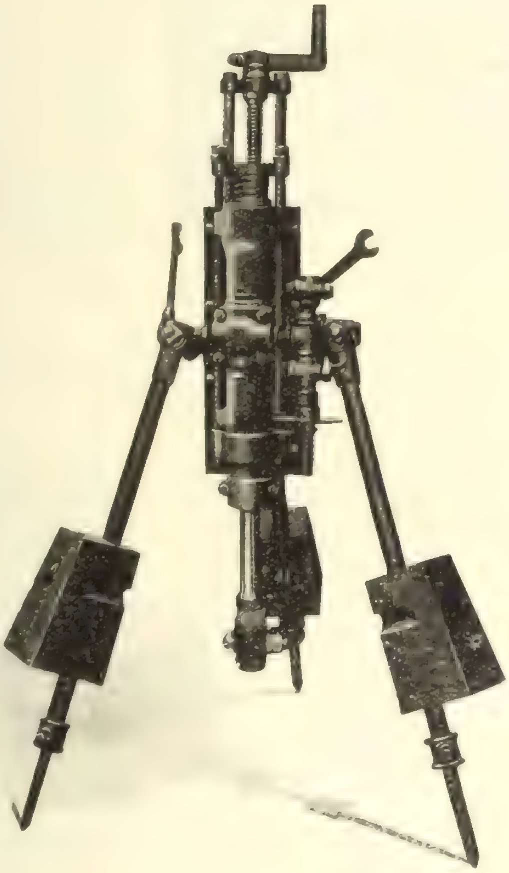

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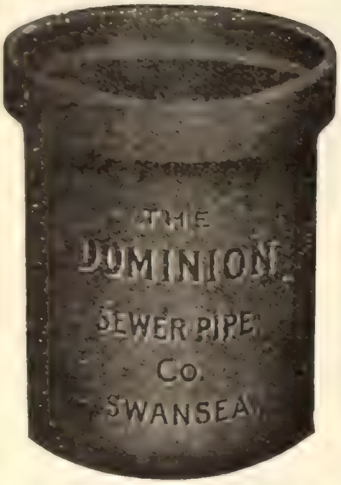

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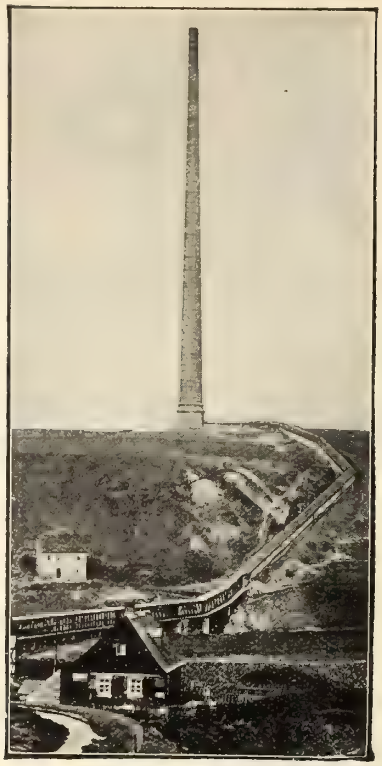

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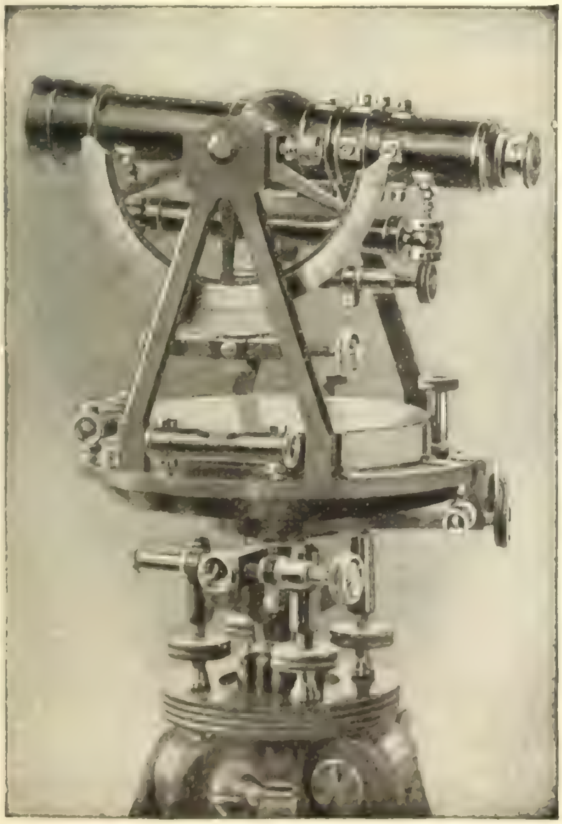

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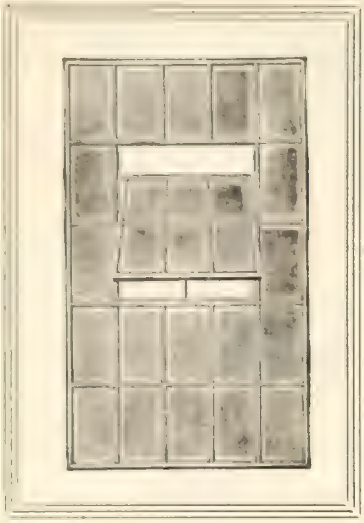

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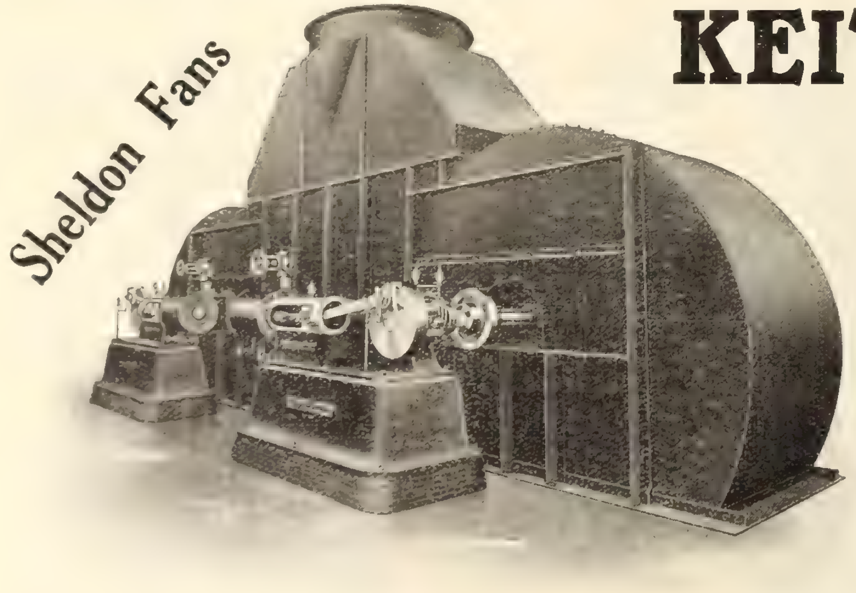

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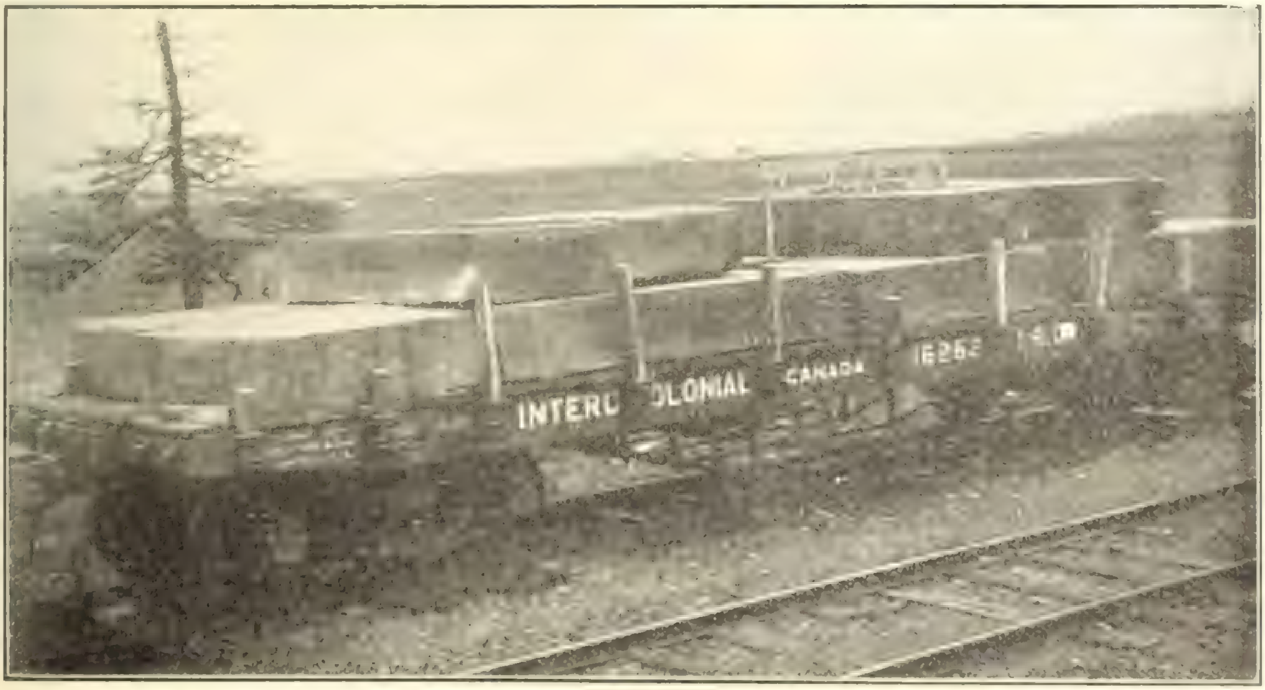

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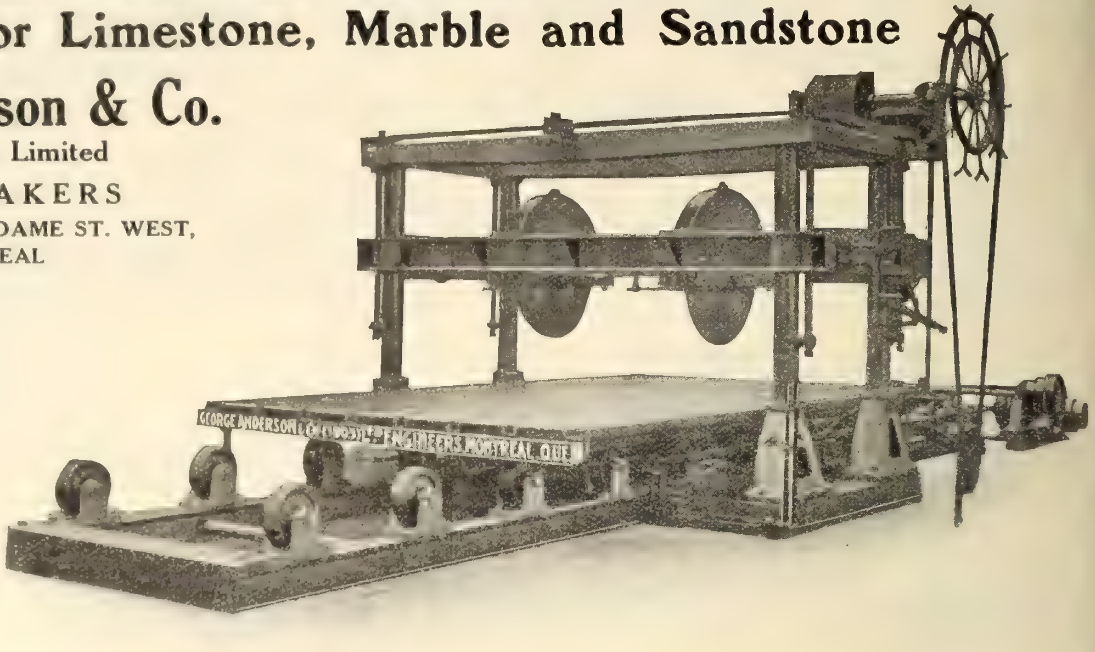

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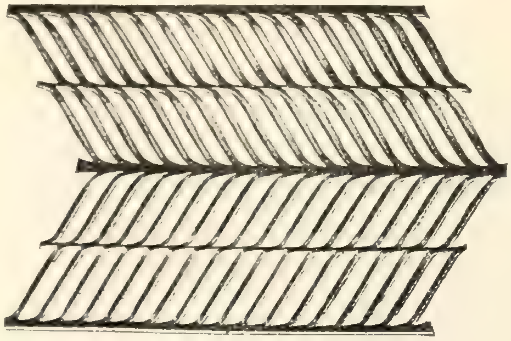
About 50 of the above Machines at work in Canada



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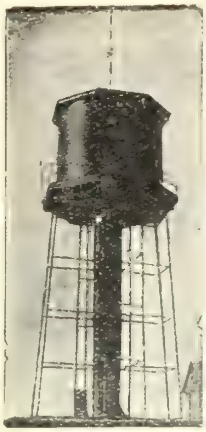

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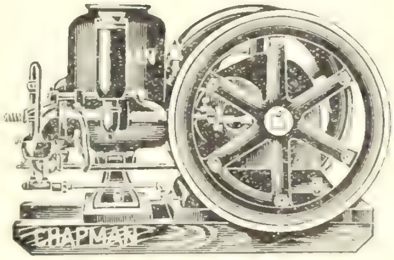

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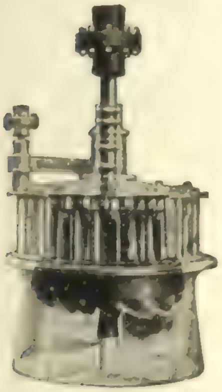

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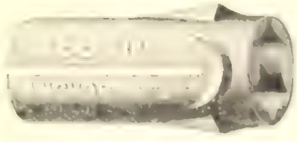

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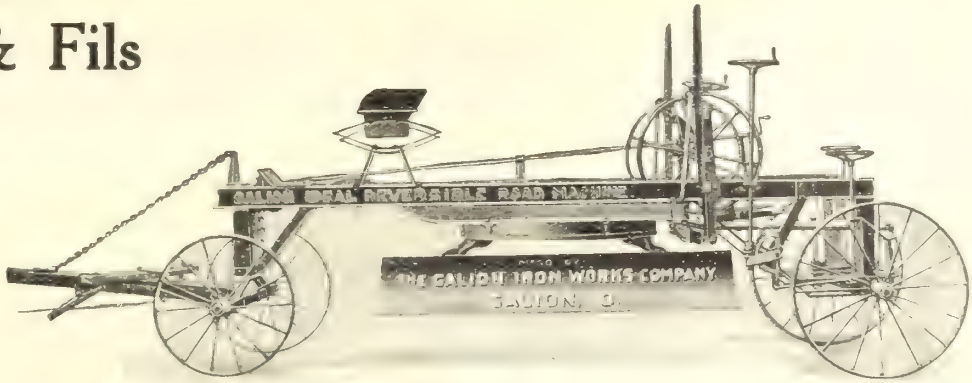
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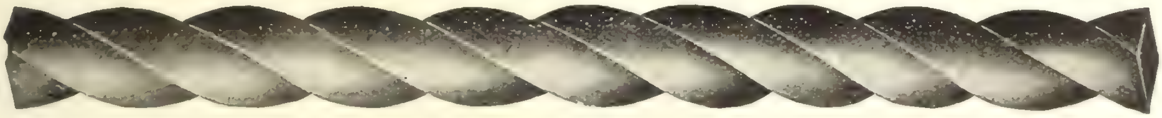

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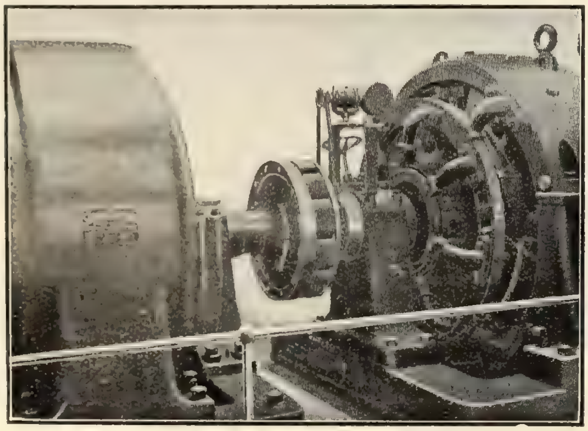

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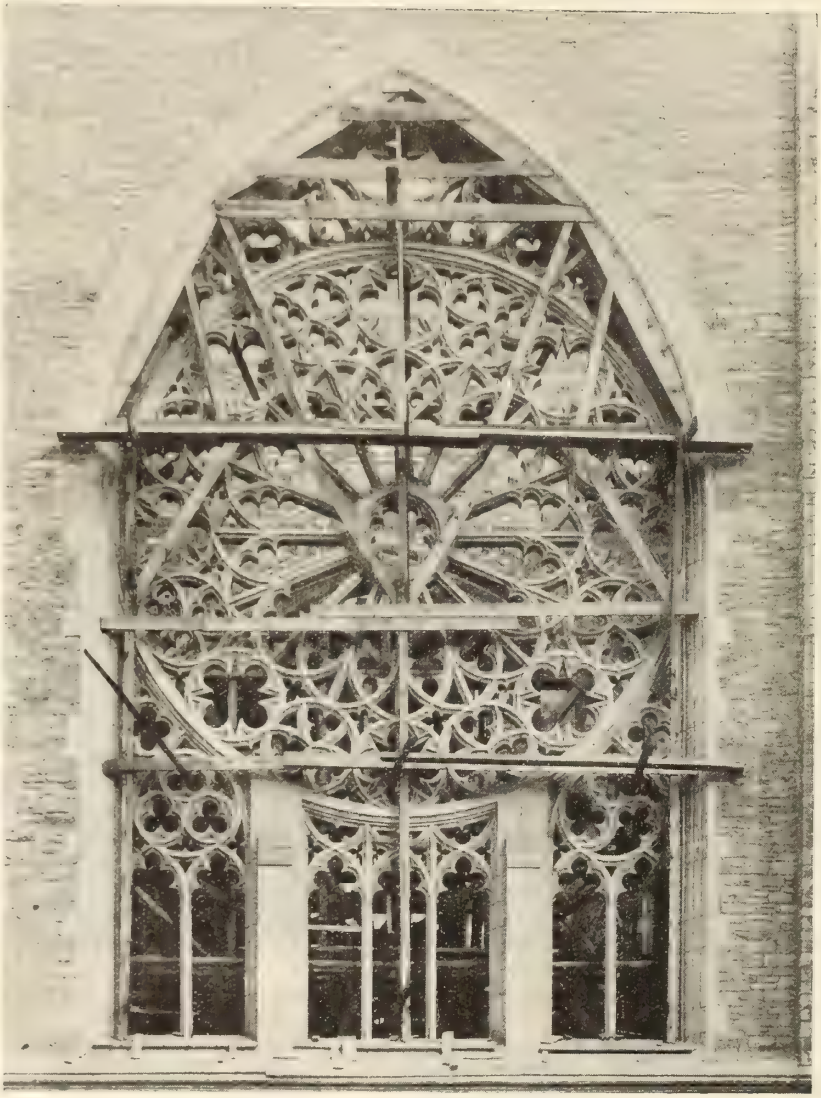

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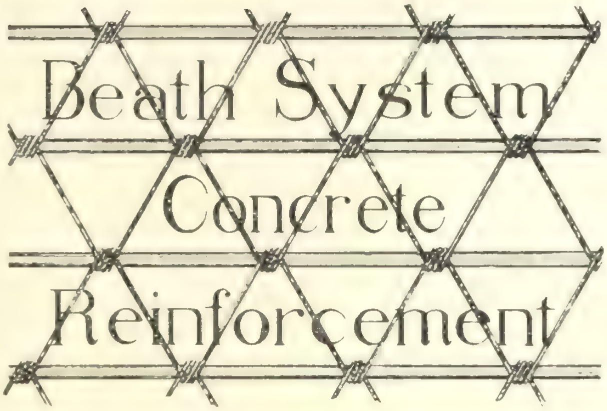

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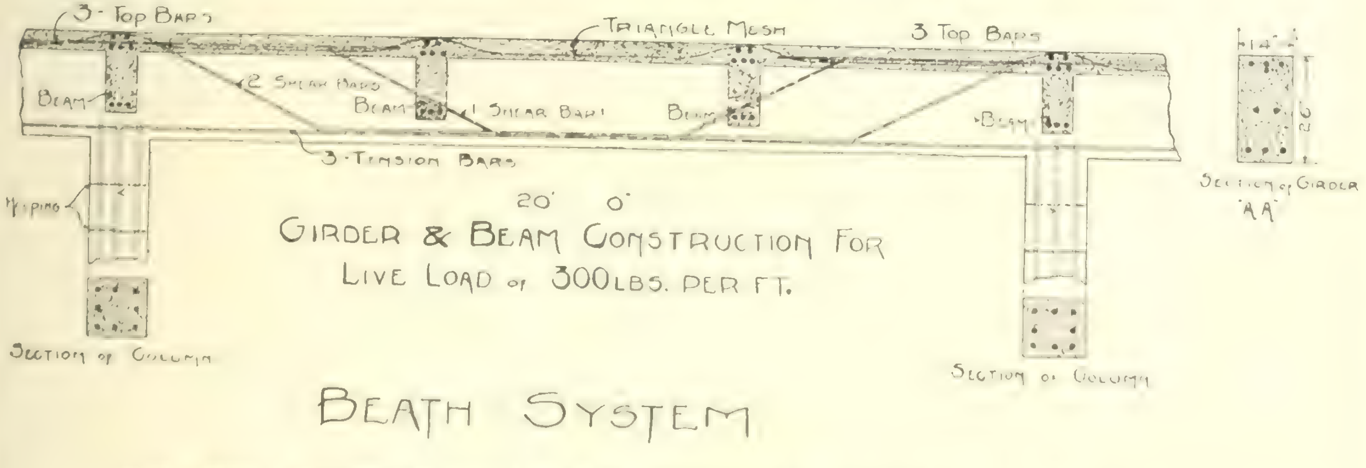

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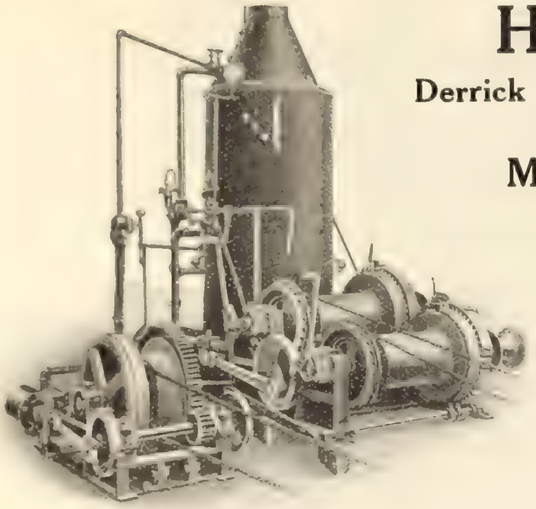

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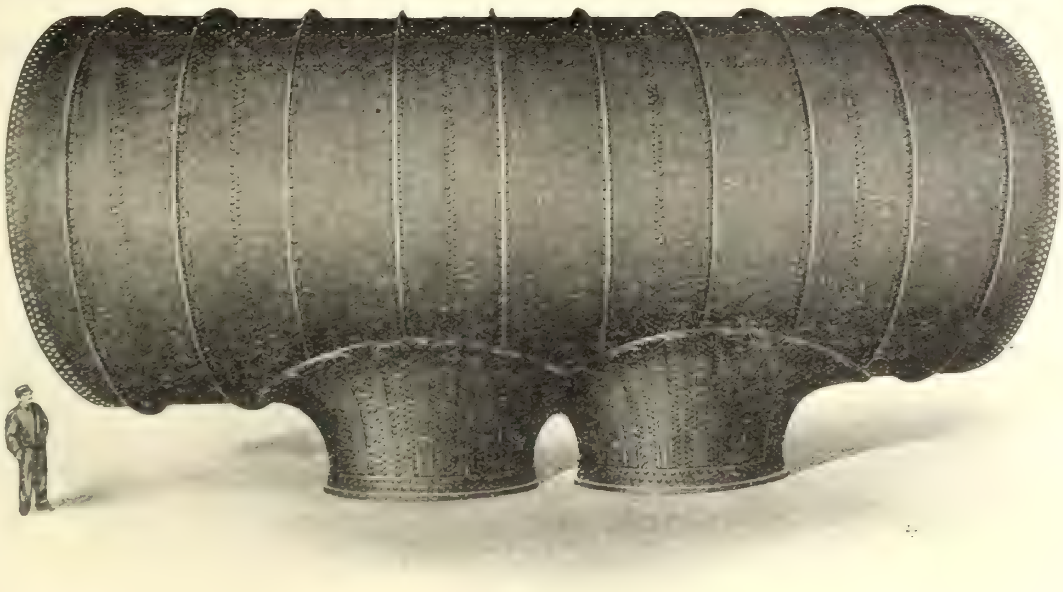

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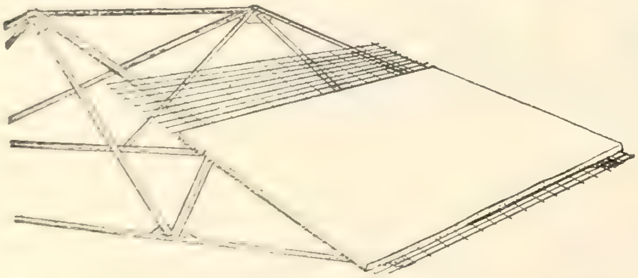

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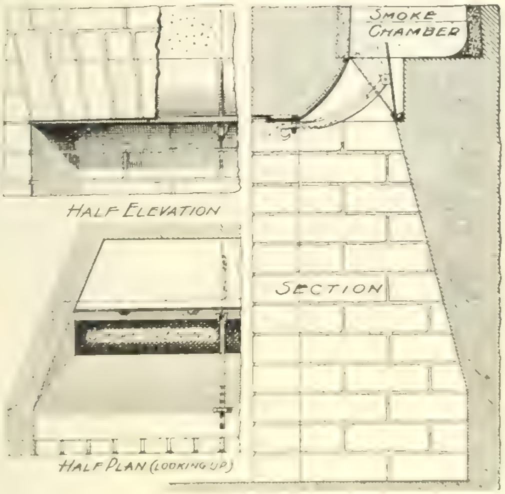

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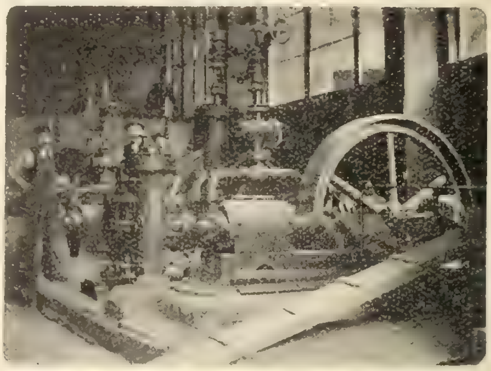
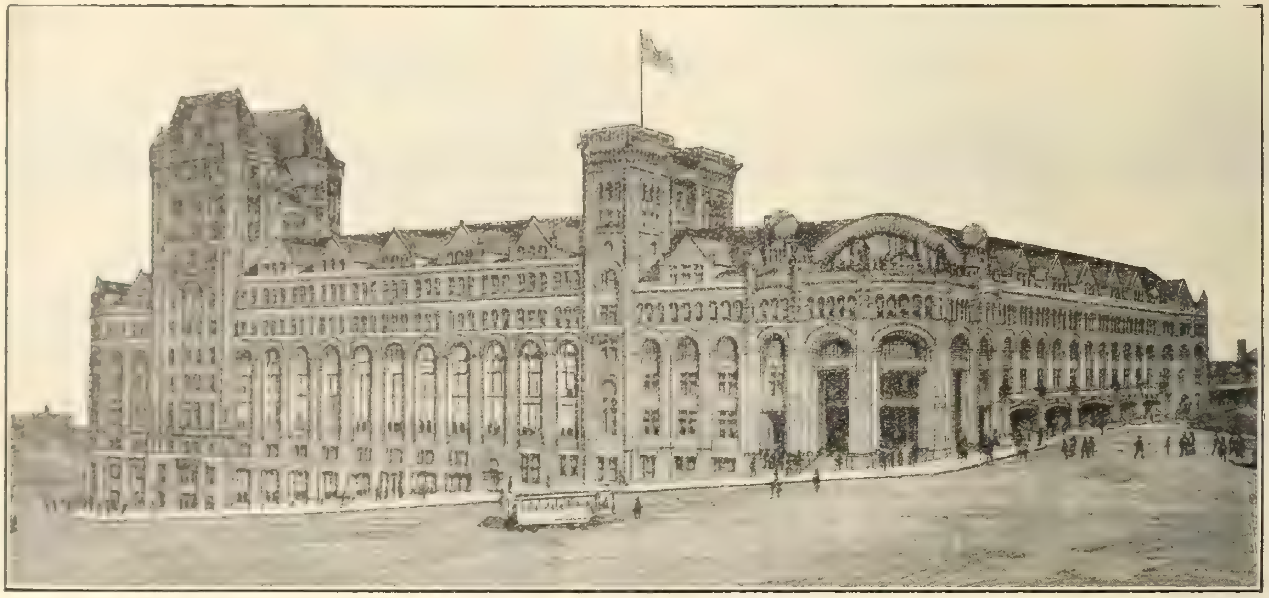


Plant in course of construction at Windsor Station



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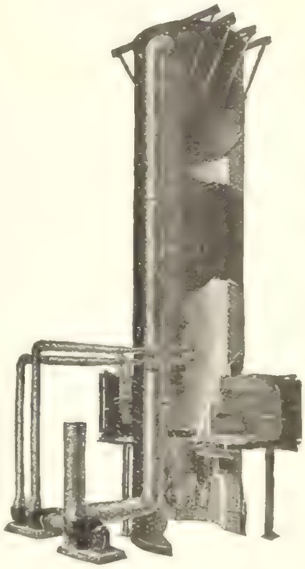

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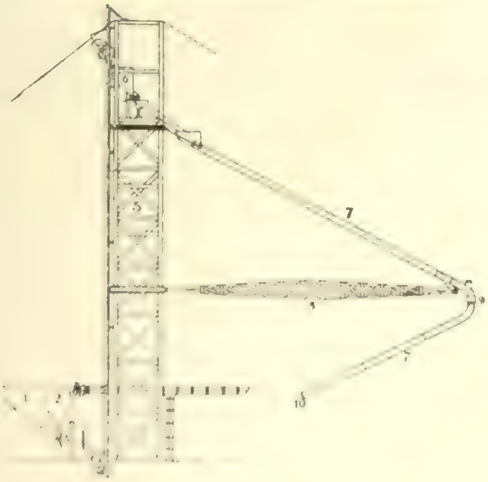

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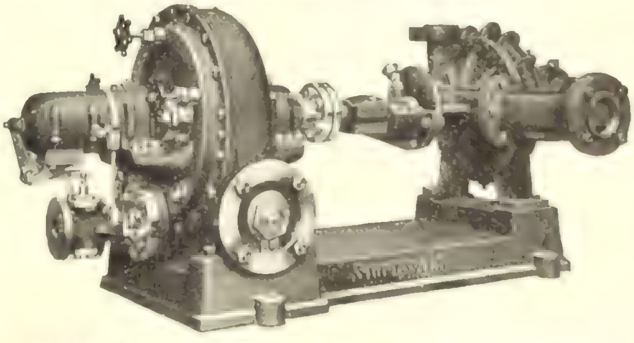

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Catalog No. 190 Describes These Turbines in Detail

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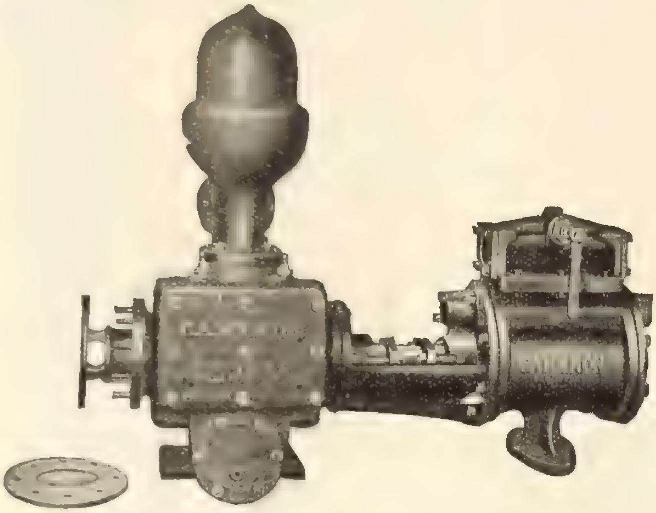

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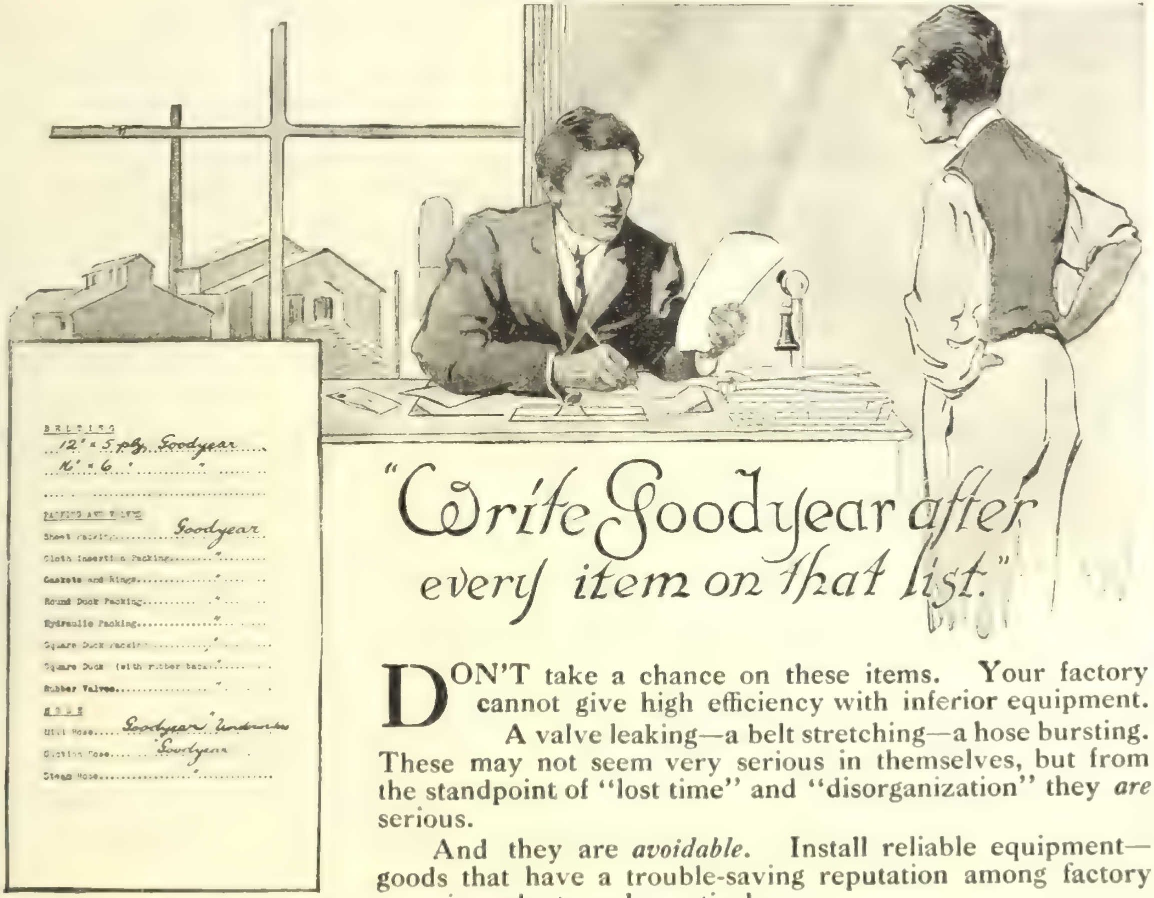
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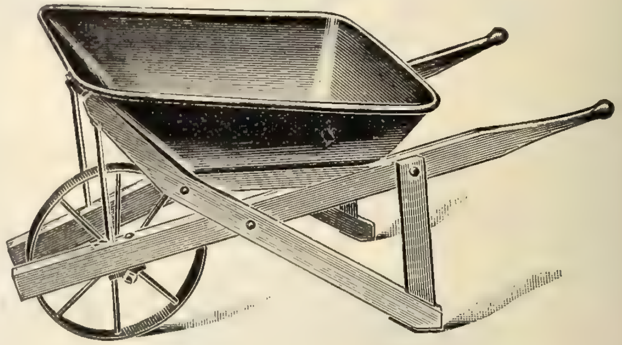

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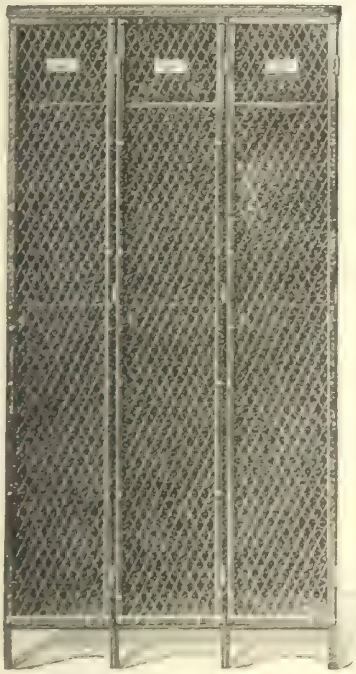

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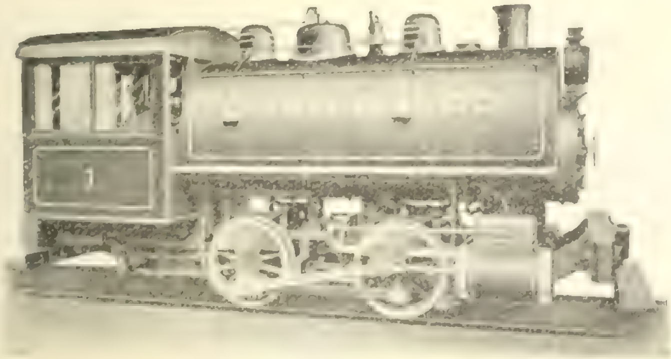

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ESTABLISHED 1886

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Mr. T. H. Mawson on Town Planning at Montreal

IN the opinion of Mr. T. H. Mawson, A.R.I.B.A., the well-known English town planner, Montreal is hopelessly behind so far as town planning is concerned. Lecturing in Montreal, Mr. Mawson expressed surprise that the waterfront had not been better utilised, and that the main streets should present uncontrolled congestion instead of orderliness and a business-like aspect. No attention had been paid to laying out some of the outlying districts, which were now being built over. Canada, like Great Britain, was plagued with self-styled economists, whose policies never stretched beyond the next election, and whose short-sightedness was responsible for one-half of municipal indebtedness.

Well defined principles must be followed in relieving bad town planning conditions, and they must be strictly practical and must take into consideration the changed conditions of transportation and the era of the automobile, which had so important a bearing on road planning. Four principles governed town planning: first, circulation, or facilities for transportation by land or by water; second, hygiene, which acted as the purifier of the city; third, a proper ratio of construction between solids and buoyants so as to allow of a free sweep of air right through the city, and, lastly, beauty, including expression of the city's individuality.

The last quality must be inherent rather than superimposed, for great art was only attained by absolute efficiency, and in town planning more was achieved by restricted architecture than by that of liberal types. The introduction of efficiency into the matter rendered it absolutely necessary that it should not be a one man affair, but should be the work of a dozen experts in a city, backed by laymen of all professions, who would co-operate to produce the most efficient result.

Safeguards in Building

Notwithstanding the care taken by building contractors in the erection of derricks and hoisting machinery, mishaps of more or less serious character occur from time to time. Consequently, it is desirable that the cause of such mishaps should receive careful attention. Apart from accidents due to faulty design or imperfect construction, failures may arise from the overloading of the plant, insecure methods of attaching the load, or from carelessness or want of skill on the part of attendants. It is not enough for a derrick to be in perfect order at the time of erection. The appliance should be inspected and adjusted, if necessary, every day by a competent mechanic; and its safe hoisting load should be written in a conspicuous place so that there may be no excuse for overloading. Manila ropes suffer deterioration, and are apt to be damaged by fraying or cutting action, while chain slings may fail owing to the fracture of a single link in consequence of transverse strain. The risk of slipping should be minimised by the judicious application of clamps, and devices should be employed in making the main connections on ropes and tackle.

Educating the Public in Engineering Matters

EDUCATING the public along engineering lines may seem a bit altruistic but the apparent groping for the rudiments and the main points of municipal engineering are seen in certain municipal papers which have been springing up throughout the country. A large proportion of the space in the best of these papers reflects the work of the engineer, and the success of the journals depends to no small degree on the skill of the editors in transforming the technical side of a city's activities into English understandable by the intelligent taxpayer. Denver has a paper that keeps its citizens apprised of what the various departments are doing. Los Angeles had until recently a weekly newspaper, a very large portion of which was given over to a discussion of the numerous engineering problems which that growing city is working out. Calgary is considering the establishment of a municipal organ. Boston is feeling the necessity of making the "Record" something more than a folio of statistics. Houston and Memphis have papers giving readable accounts of local endeavors.

Recently it was remarked that there is a decided advance in the public's appreciation of the engineer's services, for less than ten years ago Chicago's chief executive quibbled over paying $3,000 to an eminent engineer, but at present three engineers in that city's employ receive $12,000 each.

Education of the public seems a hopeless task when one considers such a manifestly foolish blunder as that made by a woman who complained that the water company officials were unfair to her because they refused to turn on the hot water, or her neighbor who was surprised that the water could not be turned on by some valve under the counter in the company's office without going to her residence, two miles away. Not so absurd is the tea merchant's protest that his customers complained on account of the taste caused by a bleach treated water, or a manufacturer's contention that the chlorine interfered with his glove-tanning operations.

The woman who claimed her hair was being bleached by the hypochlorite in the water probably had no case, but the question of sterility is not so easily decided, and it is stated that experiments as to the latter matter have actually been initiated, using monkeys as subjects. It is all very well for engineers and waterworks superintendents when among themselves to dismiss these cases with ridicule and a wave of the hand, but in actual practice it has long been the rule of many successful waterworks officials to go on the assumption that every complaint has some merit.

The engineer must explain his work in language that can be understood and realize that no auxiliary is more worthy of cultivation by him than publicity. It will pay big dividends in increased appreciation of what he is doing, of his value and actual worth to the community. Not so long ago a Wisconsin mayor, a physician, professed ignorance of the fact that there were such men as consulting engineers. It is doubtful whether engineers have so neglected any community as to enable a parallel story to be told, but there is still need of much enlightenment of an engineer's place in the material development of the country. When he and his work are better known there will be less discussion relative to licensing the engineer in order to give him a status in the city in which he has become an absolute necessity in the eyes even of those who now often consider him an expensive luxury.—Engineering Record.

Professional Relations of the Engineer*

By L.C. Holden

PERHAPS the greatest difficulty that presents itself to engineers in their ambition to establish themselves as a purely professional body is the absolute need of engineering draughtsmen by the great manufacturing and contracting concerns. A young man graduates from a technical school and finds himself thrown upon the world with the necessity of self-support; he follows the line of least resistance, and becomes a corporation employee, with the expectation and hope that conditions will change and enable him to practice his profession individually.

We are perfectly familiar with the results in the great majority of cases. These men become settled and dependent upon their position—lose courage and initiative, and allow themselves to be used in any capacity desirable from their employer's standpoint, and cease to become engineers as they hoped to be, and are draughtmen or salesmen.

A great many manufacturing concerns find it necessary to use engineers of this class for the extension of their business, and they reach out into the professional engineers' field, furnishing the services of these specialists, and in many cases to the disadvantage of the purchaser owing to the narrowness of the training of the manufacturers' engineer. When one thinks of the vast interests that are operating under these conditions it makes the fight of the professional engineer appear one of great difficulty.

It seems to me that the trouble goes back of the time when the young engineer appears on the field ready for occupation to the system under which he is educated. He begins to specialize in his junior year at college, and to his untrained mind his specialties seem all there is to engineering; whereas it is well known to the engineer of experience that the field of this specialty is very narrow and the candidate is not fitted for the broader administrative positions that are really worth while.

I presume the trouble is attributable also to the numerous inventions of recent years, which have created a demand for specialists, and these specialists are in my opinion mistakenly called "engineers." The term "engineer" seems rather to identify the man who has by technical training fitted his mind to grasp understandingly the practical things involved in all structural accomplishments in the mass rather than in detail. Such a man should be the one to claim the title of "professional engineer," and not the detail man who requires the utmost discrimination to differentiate between him and an ordinary draughtsman.

A student familiar with the engineering of steel construction may obtain a general knowledge of the other branches of engineering required for the erection and equipment of a modern commercial building; to this he adds a knowledge of the trade practices, relations, customs, and equities existing between the several trades engaged on the work, and to this he adds a knowledge of design—or what is popularly believed to be the most important function of an architect. He ceases to be an engineer if he chooses and becomes an architect, and if to all of these he adds a pronounced executive ability he will become a successful architect; but without the latter accomplishment he remains only a man who has a fund of information to sell that cannot be used by the employer who needs a technical executive head for his enterprise.

Attitude of the Public

To accomplish all that is to be desired it is necessary to consider the attitude of the public toward the profession, and the public's reason for such attitude. It is almost true that a man is worth what he receives; and his position is what he makes it. He can if gifted by nature attain any position to which he may aspire. If he chooses only to aspire to being technically perfect in but one specialty of engineering, and does not consider it necessary to acquire even a general knowledge of the others so that his work will properly coordinate with the others, he establishes a limit to his activities, and the public accepts him at his own estimate of his usefulness.

I have no doubt that your learned president (Mr. Alfred Noble, presiding) could if necessary strain a truss, but I know that he could not afford to do so when men equally capable in this department are available who do not occupy administrative positions.

It is possible that the man who is capable in applying his knowledge of formulae and theories overestimates his usefulness and importance when compared with that practical genius who has become a bit hazy on the information acquired in the classroom and which has been almost lost in the vaster school of experience and only remains as a foundation for his reasoning by which he arrives at practical conclusions that are of great value.

It is the very few who are gifted by nature to expand into the broader and more comprehensive administrative positions of the engineering profession; those who fail to meet the requirements of such positions naturally drift into the salaried positions where initiative and executive ability are not expected, and become merely links in the chain—necessary, to be sure, as part of the whole—but only links that cannot be used except as units.

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* Contribution to a discussion inaugurated by the American Society of Civil Engineers.

If you insist upon remaining, or by neglect of opportunity continue to remain such units as are easily obtainable from manufacturing or contracting concerns, you cease to give the public sufficient reason for your employment in a purely professional capacity.

Were an architect to have only an expert knowledge of one department of his activities, he could succeed only by associating with himself some other mind so gifted as to be able to grasp more than one of the many details that require his consideration.

Consulting engineers must recognize that it is the master mind and not the detail man who will be sought for positions purely professional, for the capitalist engaged in construction can secure the delivery of a specialist engineer with each piece of machinery or each hundred tons of steel.

The conditions are wrong when they require an architect to associate upon his work structural, electrical, sanitary, mechanical and other engineers, each without familiarity with the others' work, nor that of the architect who works under the directions of his employer. The architect can only be the executive head to check up interferences in the several departments and see that they properly co-ordinate to produce the results required by his employer.

Effect of Code

It has been my privilege to observe the change in the tone of the practice of architecture under the influence of the code governing the practice established by the American Institute of Architects. It has been brought up, generally speaking, to that high level desired by those members who by birth, education, and environment are expected to have high ideals in their business associations, and has set a pace for those who for any reason may not have such ideals. It has taught our members that in accepting employment from people who are not familiar with the business in hand they are accepting a position of trust, and that the exercise of their office as technical advisers must be surrounded with the most exacting rules of business integrity.

It has also done away with the spirit that used to prevail which led men to believe that the way to success was a brutal abuse of the reputation and ability of their competitors—the use of unfair methods in competition and a narrowminded jealousy of the ability and success of their fellow craftsmen.

Now we willingly accord all of the glory due to those who either by Nature's profuse gifts or by hard work and study are able to rise superior to the average or common level of our practitioners—we feel honored by their being of us, and we congratulate the public on its good fortune in benefiting by their superior abilities. Tolerance for individual weaknesses and good fellowship have grown up that were formerly unknown. We counsel with each other and in many ways are helpful when opportunity affords.

This is not sentiment alone, nor does it mean only that the conditions of the practice of architecture are more agreeable now than formerly. It means that by elevating the standards of practice, in just the same degree has the public advanced in its respect for what we believe to be one of the arts that are most potent as a refining influence upon our people.

Judicial Capacity of Architect and Engineer

In claiming high standards of practice for my profession and maintaining its importance to the public interests I am not presenting a brief in defence of those architects who conceive their full duty of preparation to be the acquirement of facility in the aesthetics of our profession, and a school knowledge of its engineering problems without that practical training and experience so necessary to qualify them properly to fill their enforced office as judge and arbiter of questions effecting the rights and property of their employers and the practical men who are obliged to execute the work under their directions, and often compelled to abide by decisions made without any knowledge of the customs which have through long years of use become standards.

It is well established that the architect or engineer shall be the judge as to the proper construction to be made of his papers—as to quality of the work and fulfillment of the agreement. In either of these professions the youthful practitioner may accept this duty lightly and make his decisions with promptness and confidence, but as one grows in experience so also grows doubt and hesitation in making decisions that take from one and give to another.

It cannot be denied that a profesion having such powers should have high standards for the exercise of those powers. If it were possible to secure an expression from the whole contracting fraternity it would undoubtedly be favorable to the conditions now existing in architecture as contrasted with those of the past.

Suggested Unit for Sewer Joint Leakage

A unit for use in measurements of the infiltration of ground water into sewers was suggested by Mr. John H. Gregory, of the firm of Hering & Gregory, consulting engineers, New York, at a recent meeting of the American Society of Civil Engineers during a discussion of a paper on "The Infiltration of Ground Water into Sewers" by Mr. John N. Brooks. The unit most commonly used, Mr. Gregory said, is gallons per 24 hours per mile of sewer. This is a very convenient unit, but it does not go quite far enough. It takes into account the length of the sewer but not the diameter. The unit advocated by Mr. Gregory is gallons per 24 hours per inch diameter of sewer per mile of sewer. A consideration of this unit will show that it takes into account not only length but diameter. Mr. Gregory has used this unit to record the leakage of water pipes, which have been tested under his direction, and has found it extremely convenient. This unit also has the advantage that calculations of ground water leakage in designing a system of sewers can be very rapidly made. To illustrate the convenience of the unit suggested it may be assumed that 300 gal. per 24 hours per inch diameter per mile of sewer is a reasonable amount of infiltration. The leakage into a sewer 18 in. in diameter would then be 5,400 gal. per 24 hours per mile of sewer, a figure very quickly and easily obtained.

To avoid the unsightly weather stains so often noticed on the face of concrete walls, it has been the practice on the Long Island Railroad to slope the tops of all walls, parapets or copings away from the exposed face about 1 inch per foot, which suffices to avoid the wash of rain water, and the attendant discoloration

Economical Plant for Sand and Gravel

The Application of Satisfactory, Modern Methods to the Solution of Bunker Problems at Vancouver, B.C.

By Robert M. Hale

THE enlargement of the uses of reinforced concrete construction and of plain concrete has so greatly increased the demand for sand and gravel that large modern handling plants are required.

In the East it has not been customary for many years to base the value of any new improvement or article on its first cost; but in the West, where conditions are different, buyers have been prone to consider the first cost of prime importance and have built and bought largely on price. This may have been good policy at one time, when a man bought an article or built a structure with the idea of reaping a rich harvest in a short time and then moving on to some new place. Such conditions are largely due to the migratory population of the West, the desire to move on to new and unsettled parts, and the hope of getting rich quickly by taking the cream and leaving the skimmed milk for those that follow. To-day these conditions are gradually changing and those who handle the skimmed milk in an economic and scientific manner are reaping rich harvests.

To handle sand and gravel no special knowledge was required, the object then being merely to build some sort of a box which would hold a few wagon loads. The idea of employing an engineer to study and solve the problems was absurd, as there were no problems to be solved. All that was required was to get a few men and some boards and build what was wanted. In fact they often dispensed with even this much by shoveling the material from the bank into the wagons by hand. No one thought of using washed sand or gravel. Timber was plentiful in this country and lumber was the main article in building construction. The rapid increase in population and the desire to build more permanently has tremendously increased the demand for clean sand and gravel.

Many of the manufacturing plants and machinery houses, in their great anxiety to increase sales, would offer to design entire plants gratis, provided certain machinery were purchased from them. Their machinery may or may not have been best adapted to meet the requirements of the particular case. The buyer, thinking to get something for nothing, and having no special knowledge of the scientific questions involved, and the salesman thinking only of that particular sale, would generally between them get most unsatisfactory results. The buyer of course blamed the machinery and the salesman had an unsatisfied customer, and peculiar as it may seem, neither side could see the wisdom in employing special talent to study the matter.

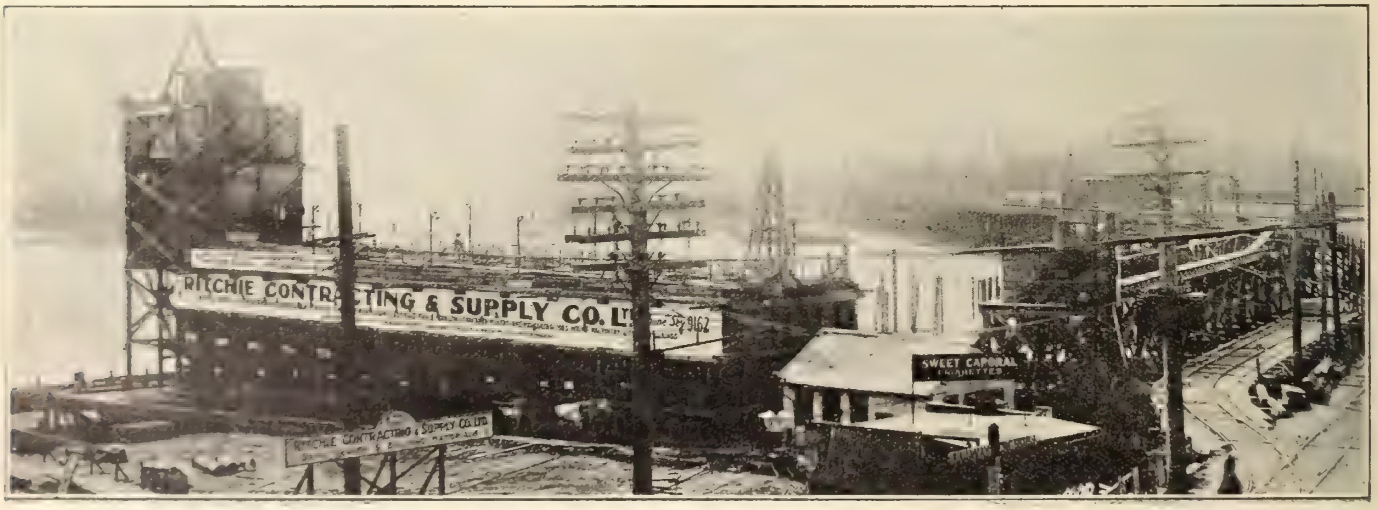
The machinery often did exactly as the manufacturer guaranteed, so the buyer had no other resource except to shoulder his troubles. The difficulty lay in the fact that neither man had sufficiently keen vision to see all the larger problems involved and to logically deduce correct conclusions therefrom.

Conservative men are to-day beginning to see the wisdom of employing specialists in each line to solve the problems of economic building and operating.

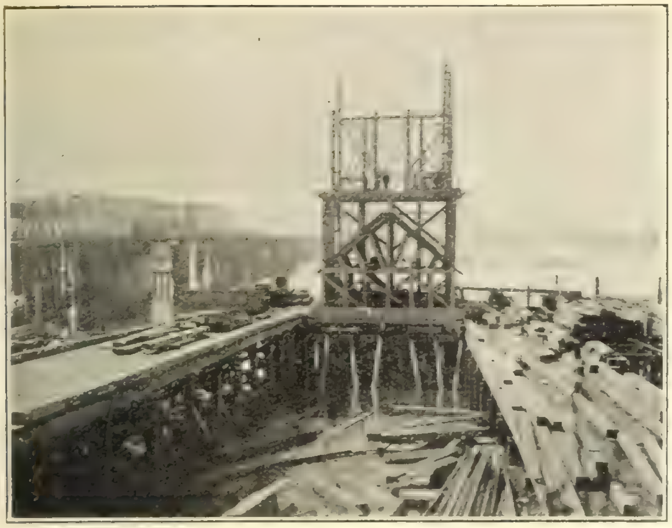
In designing a plant for any particular use the engineer must take into consideration the peculiarly local conditions governing that situation and must study these carefully and assemble them all logically in his mind before beginning. It won't do to say afterwards, "I forgot that."

When the writer was engaged by the Ritchie Contracting & Supply Company of Vancouver, B.C., as consulting engineer, there were numerous traditional practices to be overcome. When calling for bids under carefully thought out plans and specifications, he was told by a young graduate engineer, representing a large manufacturing establishment, that "unless he conformed more nearly to modern practice his firm declined to bid."

The property selected was a long, narrow strip of land on the north shore of False Creek, just west of Granville street. The property was excellently situated in regards to delivering material, being close to



Sand and gravel bunkers at Vancouver, B. C.



Type of construction in old plant of Ritchie Contracting and Supply Company.

the heart of the best business and residence section, where large quantities of building material were being used. The foreshore was eighteen to twenty feet lower than the street level and the tide had a rise and fall of fourteen feet.

In order not to be obliged to lift the material any higher than necessary, it was decided to establish the dock level just above the maximum high water, and this required that an easy grade be provided to get the loaded teams to the street level. A grade of about 4 per cent. was secured. The property was 100 feet wide by 248 feet on its longest side. The B.C. Electric Railway has a branch line running along the back of the property at an angle of 71 degrees 15 minutes with the property line.

The problem of getting the material into the bunkers had to be considered in connection with the problem of getting it out with the least possible delay to teams loading and loaded. Mr. Ritchie desired also to utilize as much of the property as possible for warehouses for the storage of other building materials, such as lime, cement, plaster, etc. He wanted to have built a system which could later on be increased without interfering in any way with the original plant.

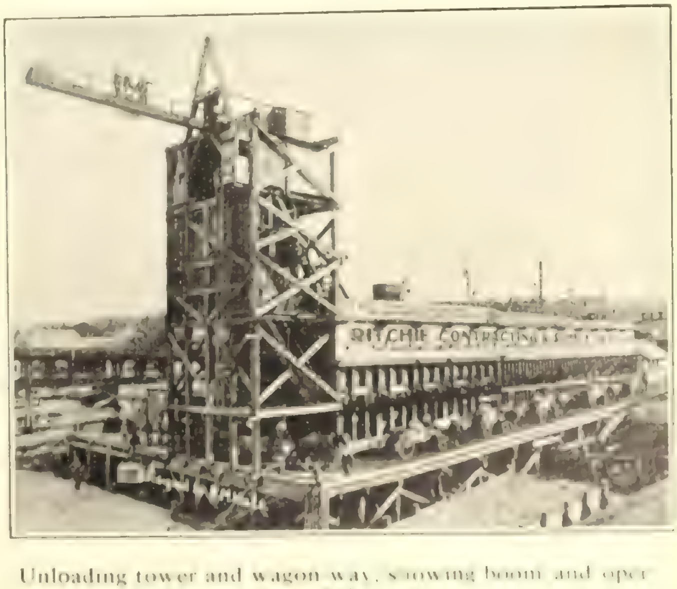
For these reasons long, narrow bunkers, with chutes on both sides for loading wagons, was decided upon. In order to prevent a congestion of traffic it was decided to keep all the wagons moving in the same direction, so the empty wagons are brought down a rather steep grade just east of the old Granville street bridge to the level of the foreshore. They pass under the old bridge and under the "out drive," pass by the shipper's office to get their tickets and then onto the driveway on the west side of the bunkers, between the bunkers and the warehouses, shown in above cut. This figure also shows the method of loading wagons described later. They then pass around the front of the bunkers to the west side, where they strike the grade that lands them on the old bridge at the street level. Between the bridge and the Ritchie property is a space of 75 feet, 50 feet of which is occupied by a contractor, and it was impossible to interfere with his operations. The wagons can be loaded on either side of the bunkers, as conditions of traffic warrant. Any heavy trucks coming into the warehouses with loads can, by a slightly longer road and easier grade, get on the "in drive" with the regular traffic. Most of the material for the warehouses comes either by water or rail and is now unloaded directly.

It was at first determined to build a small 600-yard bunker, but soon after that was finished the demands of the trade were such that it became necessary to increase the capacity to 800 yards by adding some cribbing on the top.

In determining the type of bunkers and the method of unloading many points had to be taken into consideration. First was the character and topography of the ground. Second, the contemplated increase in the size of the plant without interruption of existing operations at the time of enlarging. Third, provision of ample roadways for handling the increased traffic with the least congestion. Fourth, the grade up which this traffic had to be moved to the street level. Fifth, the problem of getting scows to and from the bunkers and storing them without encroaching on the channel fairway. Scows can only come in and out at high tide on account of the shallowness of the channel.

The conditions of traffic largely determined the type of bunker. On account of the grade it was not feasible to use the flat bottom, elevator construction bunker, with wagons driving underneath to receive their loads from above. This type is cheaper to construct, but it had the disadvantage of not adapting itself to the future contemplated uses and increase. Any type of bunker which involves the stopping and backing of wagons into stalls to receive their loads could not be considered here. Hence it was decided by the process of elimination to adopt the type of bunker with outwardly slopping bottom, which type permits the wagons to drive along either side and stop without interfering with the traffic, and receive their loads by means of hinged chutes and suitable gates.

By the same process the type of unloading apparatus was determined. Probably the simplest and least expensive of all to operate is the inclined railway, which has cars that run under hopper bottom scows to receive their loads and are then hauled up the incline by means of a hoisting engine having a direct pull on the cables, with long, easy bends. This is the easiest on the cables, requires less men to operate, has a cheaper and simpler hoisting rig and cleans the scows to better advantage. It has the disadvantage of no flexibility and limits the plant to large and expensive specially constructed scows, so that in an emergency



Unloading tower and wagon way, showing boom and operator's house the company could not go into the market and buy material on board any available kind of scow. These heavy scows are also dangerous and hard to tow in a seaway. In order to get into False Creek the scows have to cross English Bay, which body of water is apt to be quite rough, and this might delay the arrival of material at a time when most needed. This system was not adapted to this particular piece of property.

Another type is that employing a stiff leg derrick with a swinging boom. In some cases the derrick is mounted on the dock level alongside the bunkers and is either stationary or moves on a runway. In others it is mounted on top of the bunkers and may be stationary or travel lengthwise of the bunkers. In still others it is mounted on a level between the dock and the top of the bunkers and may be stationary or travel between two sets of bins or alongside of one. Where it is stationary between the dock and the top of the bunkers, the material must be delivered into a hopper, from which it is taken by some form of conveyor and lifted the rest of the way. Usually some special condition determines the use of one of these forms, but there were no such conditions in this case in favor of adopting one of these types, while there were several against doing so.

On account of the desire to utilize every inch of ground space to the best advantage, it was out of the question to mount the derrick on the dock level. For the same reason it was not feasible to unload scows along the sides of the property, and this eliminated the traveling derrick. Scows must be unloaded from the end of the dock, and this required a stationary apparatus of some kind. The choice lay between a swinging boom derrick and a fixed horizontal boom. The latter was finally determined on as the more economical and satisfactory under existing conditions.

In front of the bunkers and over the space used by the teams in going around from the in to the out drive, a heavy tower was built 30 feet wide (same width as bunkers) by 20 feet deep and 62 feet from the dock level to the bottom of the boom. On top of this tower was built an "A" frame, from which was suspended, by hog rods, a boom, on which ran the trolley carrying the bucket in and out of the tower. All strains were carefully calculated and analyzed and by means of heavy tie rods and struts were carried down to the foundations.

The boom projects 32 feet beyond the face of the tower and is composed of two 8 by 16 timbers, 60 feet long, bolted together and reinforced with steel plates. The trolley is operated along this boom by the difference in tension on the two bucket lines. The closing line tends constantly to haul it in while the holding line tends to haul it out.

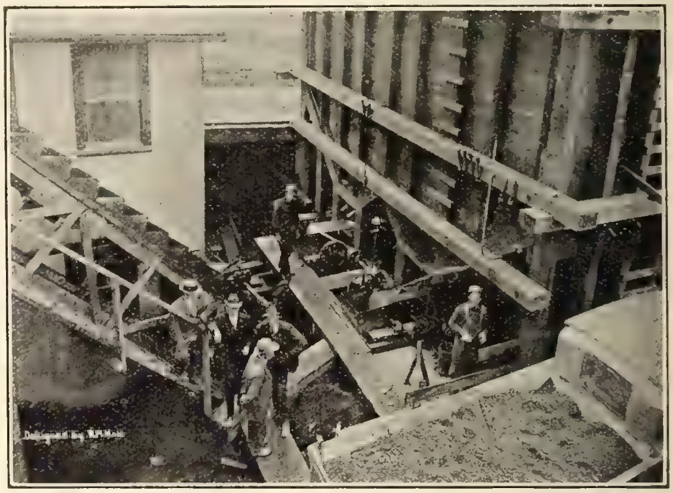
The trolley has a line from the rear passing directly to the inner end of the boom, thence over a large sheave and down to a grooved drum to which it is fastened. From the front of the trolley a line passes to the outer end of the boom and thence down to the same drum, but on the opposite side. When the trolley moves the line winds up on one side and unwinds on the other.

This drum has a brake operated by a foot lever, which is constantly in tension and holds the trolley rigidly in place.

The closing line of the bucket, the one which carries the loaded bucket, passes over a large sheave in the trolley, and thence directly back to the inner end of the boom, then over a sheave and down to its winding drum. The holding line, which lowers the empty bucket, passes over a large sheave in the trolley, thence over a sheave at the outer end of the boom, then back to the inner end, over another sheave and down to its winding drum.

By pressing down on the foot lever the operator releases the brake on the drum holding the trolley lines, and by increasing the tension on closing or holding line can move the bucket in any desired direction and at any required speed. The trolley drum has no friction and the brake is put on largely as a matter of precaution. The bucket can be operated with the holding and closing lines, merely requiring more skill on the part of the operator. To dump the bucket the operator removes his foot from the brake and the trolley stops. He then throws out the friction on the closing line and throws in the friction on the holding line. As soon as the bucket is empty he continues winding on the holding line and presses the foot brake. This releases the trolley and it runs out along the boom to the desired position. He then releases the holding line friction and lowers the bucket. He catches it with the brake on the holding line. To hoist he releases the holding line brake and throws in closing line friction.

By this system the number of levers is cut down by one and could cut down by two were it not for the human equation. A two-drum hoist is used in place of the usual three drum. The operator has four levers to look after, two frictions and two brakes (the one on the closing line being seldom used), and one foot lever.



Discharge end of bunkers—The Link Belt Company's equipment.

The hoist is operated by a 50 h.p. a.c. constant speed motor, and when once started needs no further attention on the part of the operator. This leaves him free to devote his entire attention to three hand levers and one foot brake. With a variable speed motor and a three-drum hoist this plant would require two operators in the tower.

About 12 feet below the boom the tower is floored over and at this elevation and to one side of the operator's house is projected out beyond the tower. The house has windows on three sides, the other being open into the tower, and gives the operator a clear view of the scow and his bucket at all times.

In the centre of the tower at this level is a large hopper, into which the operator dumps the material from the bucket. The clam shell bucket is used for digging and hoisting exclusively and not as a means of conveying the material over the bunkers, and by having a hopper into which several bucketfulls can be dumped the bucket is used constantly for what it was intended. The remaining space on the operator's floor is used for a store room and a shop for repairs.

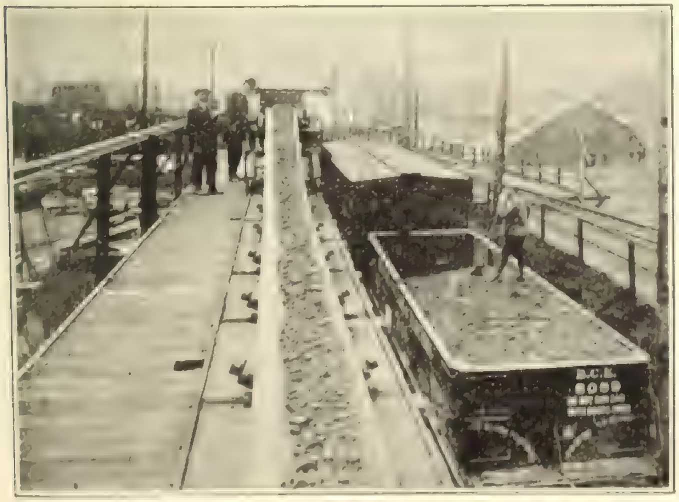
On the floor below, which is on a level with the top of the bunkers, is placed the main hoist and a small hoist for a car haul.

The material is taken out of the hopper on both sides by automatic gates and delivered to the two two-yard cars shown. These cars operate on tracks, which are 13 feet 4 inches centres and 36-inch gauge. The loaded cars run down an incline lengthwise of the bunkers and are dumped over any bin desired. Above the car is a cable running the full length of bunkers and held at the tower end by a heavy counterweight. On the cable is a button which can be easily moved. A forked lever which projects above the car and around the cable, strikes the button with considerable force; this lifts the counterweight and throws the lever over and opens the gates in the bottom of the car. A fixed stop is provided against which the lever strikes on its return journey to the hopper and closes the gates. The tracks are inclined in the tower on a grade of 8 per cent. to give the cars a good start, but over the bunkers the grade is changed to 2 per cent.

A 7½ h.p. a.c. constant speed motor operates a two-drum side by side hoist to haul the cars back up the incline. All operating levers for the hoist and gates are carried to a platform where a second operator easily controls the distribution of the material in the bins. The operator is protected from the weather, but has a clear view of both cars at all times. The cars travel 156 feet over the top of the bunkers and have proven a most economical method of distributing material.

The main bunkers rest on extra heavy creosoted piling, driven quite close together. Hard pan was encountered close to the surface and the penetration of the piling was only from two to six feet. However, the settlement in a year's time has hardly been perceptible. The bunkers are the framed type, having the bottoms built as a self-contained truss. This simplifies the construction of the balance of the structure.

No special difficulties were encountered in building the plant except inconvenience in handling material. All of the piling and lumber was delivered on scows at once. There was no room on shore on which to pile and frame the lumber, so it was necessary to drive and cap the piles for the warehouse dock and store the lumber there. The rest of the piles were driven as rapidly as possible, and the roadways built. This gave some place to frame the lumber, and when this was done, the erection proceeded rapidly.



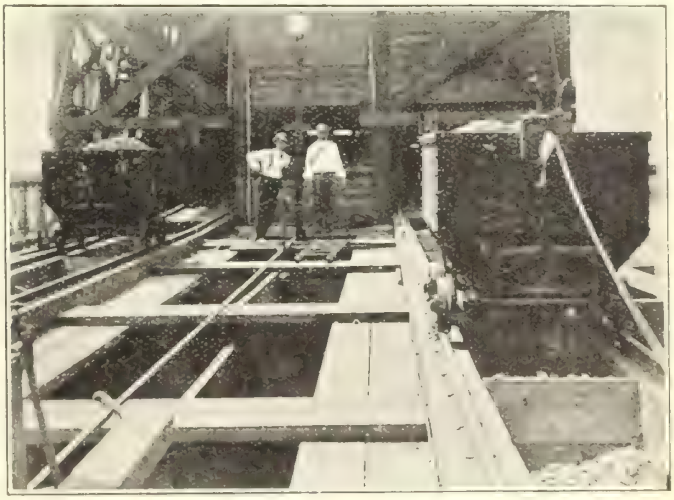
Belt conveyor for car loading The Link Belt Company's equipment

Bids were called for the different sections of the work, but all tenders were so high that it was decided to carry on the work by day labor under the supervision of the engineer. The work was completed at a cost of $1,500.00 less than the lowest bid.

The bunkers had been in operation but a short time when the business grew to such proportions that Mr. Ritchie decided to proceed with the extension at once.

The original bunkers were designed for delivering into wagons only, but the addition was to be built to deliver into wagons and railway cars. This complicated the problems considerably, as the property did not readily adapt itself to getting in a sidetrack. An additional 100 feet of land was secured to the west of the old property.

It was impossible to get the cars down to the bunkers to load directly on account of the steep grade, so it was necessary to take the material to the cars. The B.C. Electric Railway contemplated some improvements in their trackage, and these had to be taken into consideration. Without going before the railroad commission, a long and tiresome proceedure, permission could not be secured to cross Granville street with another track. Mr. Ritchie could not afford to take the chances of delay in going before the commission, so he instructed the engineer to proceed without crossing the street. The sharpest curve which the B.C. Electric would permit had a radius of 151 feet. A lay-out was made showing all feasible arrangements of tracks, and track No. 4 was finally decided upon as having the least objections.



Bottom dump gravel cars.

The bunkers were built with a hopper bottom, but sloping towards the centre. This gave vastly more storage space, but it did not permit of their being completely emptied by wagons alone, the gates, of course, having to be a fixed height. When the material fell below the level of the gates, some other method of getting it into wagons had to be devised. An emergency hopper was introduced into the conveying system, and the bunkers could then be emptied either into wagons or cars.

Bids were called for for the conveying system under general specifications, it being thought best to leave the details of machinery construction to the various manufacturers.

The conveying system is designed to handle sand, gravel or crushed rock (under 3 inches) at the rate of 100 yards per hour. It consists of two 20-inch belt conveyors, "A" and "B," which run horizontally under the new bunkers their full length of 96 feet and receive the material through 48 gates from the bins above. Each conveyor runs independently of the other, so that with either conveyor running the full capacity of the system will be attained. With both conveyors running, the feed is cut down so as not to overload elevator "C."

Both conveyors dump into a common hopper or curved chute and deliver onto the foot of elevator "C." High water comes nearly up to the point of delivery and water is encountered at all times a short distance below the surface of the ground. For this reason the pit was made as shallow as possible, and yet permits sand to run. All conveyors are provided with adjustable brushes at their head ends, to keep the belts clean.

Elevator "C" lifts the material from conveyors "A" and "B" to conveyor "D." The elevator runs at an angle of about 46 degrees, and is of the continuous bucket type with roller bearing chain of 18-inch pitch. It discharges by means of a bifurcated spout to conveyor "D" or to the wagon hopper between the conveyor trestle and the spur track.

Automatic grab bucket—Westerman Iron Works, makers.

The conveyor "D" runs horizontally on a trestle above and parallel to the railroad trestle, and has an automatic self propelled tripper designed to discharge into railroad cars. This tripper has a long-hinged extension spout and delivers the material near the centre of the car, thus reducing the amount of trimming required. The extension is pulled up out of the way to permit box cars or the motor car to enter the sidetrack.

The two conveyors under the bunkers are driven by a 7½ h.p. a.c. motor at the head end. The centre shaft has two Link Belt disc friction clutches for operating each conveyor separately. Elevator "C" is driven by a 15 h.p. a.c. motor geared directly to the head. Conveyor "D" is driven by a 7½ h.p. a.c. motor, also geared directly to the head. All motors are constant speed. All starting boxes are placed in the tower at the head of the elevator. Push buttons are installed every 12 feet along the entire system, so that the whole apparatus can be shut down quickly from any point in case of accident, the push buttons throwing out an automatic switch. They are started from the tower, however. A system of electric bells is installed, by which the man on the tripper can regulate the supply of material and communicate with the man under the bunkers.

The addition was rapidly built without any interruption to the operation of the original plant, and no particular difficulties were encountered. It was impossible to drive piles for the bunkers or trestle, so they were built on posts resting on mud sills. Ample surface was given for each footing and some settlement was looked for. Each 12-foot section of the new bunkers carried a load of 450 tons when full, and when the entire bunker was filled the settlement was not excessive. As soon as one section was about finished, the demands of the business were growing so rapidly that it was necessary to use it at once. This made the initial loading on the foundations uneven and more settlement occurred than would have been the case had the loading been more gradual and uniform.

The additional 100 feet of property was bulkheaded and filled in and used for storing brick, tile, reinforcing steel, concrete mixers, and other materials not affected by the weather. Two slips were provided for unloading brick from scows.

One of the cuts shows completed plant; the railroad and conveyor trestle and the additional 100 feet of ground before the bulkhead had been built.

The original plant was designed to unload at the rate of 50 yards per hour, but has been doing frequently in the busy season from 60 to 80 yards per hour. The plant is in operation from 14 to 16 hours a day. The completed plant has a storage capacity of 3,200 yards. The conveyors can load cars at the rate of 120 yards per hour. The company has 60 teams and three auto trucks delivering almost constantly, frequently night and day.

The clam shell bucket and cars were designed by Mr. W. L. Newell of Seattle. Mr. Newell also designed the system of handling the bucket lines. The Westerman Iron Works, of Seattle, furnished the clam shell.

The main hoist and car haul were supplied by the North-western Iron Works of Seattle. The motors for these hoists were manufactured by the General Electric Company.

The Link Belt Company of Chicago furnished the conveyors and elevator. The belts were furnished by the Vancouver Rubber Company, and the motors for the conveyors and elevators by the Canadian Westinghouse.

Mr. E. B. Hussey of Seattle was associate engineer.

The plant was criticised considerably by engineers and those in the gravel business, at first largely because it was a departure from the usual custom in vogue here, but after a year's operation it has economically and satisfactorily handled much more material than was contemplated. It has been heavily overloaded a good bit of the time, but has responded to every demand put upon it. The repair cost has been comparatively insignificant, and the stoppages due to breakdowns very few. The cost of operation has been decidedly low, and were it not for the inconvenience of the tides, this cost could be reduced somewhat. The power cost is less than one-half cent per yard, including all lights for office and night work. It is doubtful if any steam plant can show a better record. It is not exceeded by any plant in the Northwest for its conveniences and economy of operation and first cost.

Standards for Hygienic Purity of Public Water Supplies*

IN 1905 there was issued by the American Public Health Association a report of a committee on standard methods of water analysis. This report was the outcome of efforts begun as early as 1894 to secure uniform and efficient methods for water analysis and was the immediate result of the labors of some of the active workers of that time in the chemistry and bacteriology of water and sewage. The writer was privileged to be a member of that committee and mentions it because of his personal knowledge of the attitude of the members toward the subject of standards in general, and for the reason that certain instructive comparisons may be drawn between the conditions existing then and now.

The following quotation from the committee's letter of transmittal accompanying this report will serve to show its attitude: "It is said by some that standard methods within the field of applied science tend to stifle investigation and that they retard true progress. If such standards are used in the proper spirit this ought not to be so. The committee strongly desires that every effort shall be continued to improve the technique of water analysis and especially to compare current methods with those herein recommended, where different, so that results obtained may become still more accurate and reliable than they are at present. The methods of analysis presented in this report as 'standard methods' are believed to represent the best current practice of American water analysts and to be generally applicable in connection with the ordinary problems of water purification, sewage disposal and sanitary investigations. Analysts working on widely different problems manifestly cannot use methods that are identical, and special problems obviously require the methods best adapted to them; but, while recognizing these facts, it yet remains true that sound progress in analytical work will advance in proportion to the general adoption of methods which are reliable, uniform and adequate."

The rapid advance of sanitary science in the past ten years has made available a large amount of knowledge which we are using with marvelous effect in the practical problems of sanitation. Bacteriology in particular has enabled us to deal effectively with many diseases, because we now know their origin and the manner in which they become disseminated. The remarkable results in the diminution of water-borne diseases, obtained by the purification of many public water supplies, are a good example of the aid sanitary science has been in dealing with a practical problem intimately related to our every day life.

The improvement in bacteriological technique did not stand still, as some feared it might, because of the adoption of uniform methods of examination. In point of fact the effect has been rather to stimulate research by subjecting all new methods to rigid comparisons with the adopted methods. The latter have been regarded more as the best available but only tentative standards of measure that we possess. By common consent they would be quickly dropped, if better standards could be found. Five years after the adoption of the standard methods a revised set of methods was issued by a second committee of the American Public Health Association. These revised methods, like the first, will have to bear the test of time and in due season will be revised again to bring them to the forefront of analytical practice.

It is evident that unless there are fairly accurate methods of measurement for the purity of a drinking water, and unless these methods are reasonably uniform, the results obtained will only lead to confusion and bitter disputes. The question, therefore, resolves itself into this form: Are our modern standard bacteriological methods sufficiently reliable to measure properly the hygienic purity of water? It is difficult to answer this question without qualifications. Without hesitation one may say, that as we can find specific disease germs in natural waters only with a great deal of difficulty, and that if found a knowledge of their number and virulence is of prime importance before the water can be absolutely condemned, it does not appears that our methods are as yet entirely adequate. On the other hand the circumstantial evidence easily and readily obtained by examining the water for the presence of organisms which may be and usually are associated with disease germs would lead one to declare that some of our methods at least are quite sufficient to establish the degree of impurity which might exist.

Quite apart from bacteriological methods of examination, we know by observation that settlement, filtration or disinfection of public water supplies lead to a reduction in certain diseases which appear to be derived from drinking polluted water. Indirectly, therefore, it becomes possible to establish a relation between the bacterial content of such waters before and after any method of purification.

Value of Investigation

It seems to the writer that if this subject of standards of purity is investigated in an open frame of mind and with the same spirit of impartiality that the subject of standard methods of analysis was approached, it will be possible to establish tentative standards of purity. These standards will of necessity be subject to modification by local conditions and may have to be frequently revised. If it is kept in mind that a drinking water is hygienically pure when it does not produce disease or disturb in any way the normal physiological processes of those who drink it, it will not be difficult to agree upon what shall constitute the safe limits of bacterial and chemical purity.

Standards of purity for public water supplies will have little value unless some central authority has power to enforce them upon backward and reluctant communities. Some of our states have vested considerable authority in matters pertaining to water supplies and sewage disposal in their boards of health. Where such authority is properly exercised and subject to review by legally appointed scientific experts, the best of results may be obtained, for an ignorant or parsimonious community could be protected against its own disregard of sanitary laws. There is a broad field for the exercise of the national government's authority in matters relating to the pollution of interstate and international waters which may be used as sources of public water supply. If the now scattered bureaus of the national government, which pertain to public health, were consolidated in a national department of health much might be done toward establishing standards of purity for public water supplies, even though the national government were unable to supervise supplies exclusively within the jurisdiction of the states.

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*Paper read before the Indiana Sanitary and Water Supply Association by J. W. Ellms, Cincinnati.

The writer believes that the angle from which the subject of standards of purity is viewed is of fundamental importance for a practical solution of the problem and has endeavored to set forth this phase of the matter, instead of attempting to state what such standards should be. The whole question is one which is intimately related to the extent of permissible pollution of natural waters and must be considered in connection with it. By what method these problems shall be attacked is perhaps open to question; but the writer would suggest that it may be got under way by the appointment of delegates from each of our large engineering societies, waterworks and sanitary associations, who shall meet to formulate a plan of procedure. These delegates may work in conjunction with any existing committees now in the field, or with any state or federal departments which have already given this matter some attention.

Some of the points which such a body should discuss are as follows:

1. What diseases may be legitimately regarded as water borne? This involves a consideration of the Mills-Reincke phenomenon and the Hazen theorem as set forth by Prof. W. T. Sedgwick and Mr. J. S. MacNutt, and the ideas of chronic intestinal tract infection advanced by Messrs. N. S. Hill, Jr., and L. R. Whitcomb. It means a careful analysis of all the available and reliable vital statistics of those communities having impure water supplies as well as those having pure supplies.

2. A clear definition of what really constitutes a pure drinking water. This means that much light is needed upon the relative number and kinds of bacteria, the nature and amount of the organic and inorganic matter which may be present in public water supplies, and their significance in the causation of disease. It necessitates the examination of the available bacteriological and chemical data of public water supplies, and its classification in relation to vital statistics.

3. The selection of the maximum limits for the numbers and kinds of bacteria in a drinking water, and the permissible amounts of organic and inorganic matter which such a water may contain. This selection, of course, will be the result of the logical conclusions reached from a study of the compiled statistics, and should be adopted only after a careful consideration and free discussion of the evidence.

Recent Advances in Rapid Filtration

SOME of the more recent advances in the design of rapid filters were discussed by Mr. F. B. Leopold, General Manager of the Pittsburgh Filter Manufacturing Company, in a short address before the recent annual convention of the Indiana Sanitary and Water Supply Association. The following matter sums up Mr. Leopold's discussion:

One general feature of first importance in rapid filter design in which a rapid advance is now being made, relates to the preparation of the water before it goes to the filters, that is, to the design and arrangement of the sedimentation basins. A great many of the earlier type of basins were designed without any particular regard to efficiency. It was taken as a fact that a basin contained a certain quantity of water, and irrespective of the way it was added to the basin or taken away from it, would give a certain number of hours' sedimentation. Experience has demonstrated the fallacy of that theory. The effectiveness of the basin depends entirely, of course, on the design and arrangement of it. With a short, square basin type, taking the water in one corner and out at the other, there is utilized but a very small percentage of its available or possible sedimentation value. The design of basins has been very rapidly developed and at the present time there are comparatively few mistakes made in the general design of sedimentation basins. But there is still room for considerable improvement in the manner of delivering water to the basin and of taking it away. The usual method probably still is to deliver the water through an inlet pipe at one end and to take it out through an outlet pipe or overflow funnels at another point. In designing water flushing plants with which I have been familiar for a good many years we would not think of adding a chemical solution to the water without some method of thoroughly mixing that solution with the water to get the value of it. In designing filter plants, however, we pump the water into the basin through an outlet pipe and then drop the solution in front of the pipe or at some point along the wall, depending upon a mixture in that way. We have lately been designing mixing chambers in which we provide a capacity of anywhere from a half hour to one hour's time. The walls added in the mixing chamber, which is highly baffled, carry the water through and give it a chance to thoroughly mix before it goes to the settling compartment of the sedimentation basin. Our observations indicate that with a properly arranged mixing chamber we could get equal results in a basin three-fourths the size of the basin that was so designed that the water was admitted through a pipe with one, two or three outlets, and I believe that the tendency of plants in the future will be to provide mixing chambers for the proper mixture of the coagulated solutions before they enter the sedimentation basin proper. It will mean economy in the quantity of coagulent used and better efficiency of the same sized basins or equal efficiency of the small-sized basins.

Another feature that is being recognized is the question of proportional application of the coagulent to the water that is being treated. In the small plant this is a matter of comparatively small moment. In the plant of any capacity it is necessary to provide an amount of coagulent necessary for the maximum pumpage and to then run the chance of insufficient treatment. In doing this, there is of course a certain percentage of waste. There have been several types of apparatus designed for the adjustment of coagulent feed in exact proportion to the flow of the raw water to the sedimentation basins. In this way, of course, economy in the use of the coagulent is obtained, and in a plant of ten or fifteen or twenty million gallons' capacity the saving amounts to a good many dollars in the course of a year. The first plant of this kind was the New Orleans plant. Since then there have been a number of them, notably Minneapolis, Grand Rapids, Columbus, Indiana, Erie, Pa., and several other small plants. I believe that will receive more serious consideration from engineers as the economies effected are realized.

Another feature in which there has been considerable progress made is the strainer system. There has been considerable difference of opinion as to the relative efficiencies of different types. The older type was the manifold type of wrought iron, small size, and there was more or less trouble in corrosion and stopping up and necessity for taking them out at intervals and cleaning them out. Those have been favored to a very large extent by a considerable number of engineers. Difficulties have developed in this type of construction, and I am personally inclined to think that some of the engineers who favor that type of construction will come back to the lateral system; not the old type of lateral system, but the present developed system which has lateral pipes made of cast iron with strainers. They won't crumble and break off. If they are made large enough and have plenty of area the corrosive trouble experienced in the old wrought iron systems will not occur.

The matter of low and high velocity of flow in washing is still a problem. We put in plant of either type of wash. The only conclusion that can be reached, as far as the evidence that I have available shows, is that the highest economy in plants operating is being developed by those of low velocity wash.

The question of the strainer over the gravel is one that should be considered. When we consider that the area of the sand bed is nearly 300 times greater than the opening from which the water is discharged into it, it is evident that it is absolutely impossible with any rate that could be legitimately used to disturb a properly arranged gravel bed. This probably originated a number of years ago when sand beds were imposed directly on the strainer system and the strainers gave a great deal of trouble in stopping up with the sand. Then gravel beds were placed between them from 4 to 6 inches in thickness. That gravel never exceeded ⅜ ins. in diameter and when the water came through the strainer opened with such velocity at that point that it would shoot the small gravel right out into the sand bed. But with a layer of heavy gravel upon the strainers, gravel anywhere from 1 in. up to 2 ins. in size, it would be absolutely impossible to displace it with the velocity that could be gotten through the wash water system. I believe that several of the large plants that are going to be built in the near future will be built with the concrete lateral system.

A concrete bowstring roof truss is a feature of the recently constructed Belleville Theatre in Paris, France. The truss has a clear span of 69 ft. and an overall height of about 15 ft. The top chord approximates a parabola and is connected with the bottom member by six vertical suspenders, spaced about 10 in. on centres. There are no diagonal members to the truss, all provisions for live load being taken up in the transverse connections between trusses.

Ordinary Precautions in Construction Work

NUMEROUS restrictions, safeguards and precautions to prevent accidents in building construction are commonly observed, especially by the larger and better-organized contracting and construction firms. Many of them are obvious and suggest themselves to anyone familiar with the work and its conditions. A somewhat extended list of these precautions, together with some elaboration and explanations, is given in a recent issue of the "Travelers' Standard," a periodical published by the engineering and inspecting division of the Travelers' Insurance and Indemnity Companies, of Hartford, Conn. The following summary covers the brief enumeration of the principal points.

In the demolition of old buildings, high walls should not be left standing; thin walls should be taken down from scaffolds; materials should be thrown down from a height only when guarded by a watchman below; brick and loose materials should be chuted to the street in closed chutes; material should not be accumulated on floors or allowed to fall on the floors from a height, and stair railings should be maintained as long as possible.

In steel erection only strong, spry, temperate, coolheaded, reliable and experienced men should be employed. They must avoid unnecessary danger, such as riding up on hoisted loads or sliding down hoist ropes. They must not work during high winds or on icy beams, or work too long in exposed places.

All permanent floor openings should be planked over, or well guarded, and the planks and guards must never be removed while protection is necessary. Floor-arch construction should be maintained within two stories of the erection derricks and floor beams not arched should be thoroughly covered with planks. Derrick floors should be planked solid, and no planks should have cantilever ends.

Scaffolds should be constructed with great care from abundance of first-class lumber. Swinging scaffolds should be very thoroughly examined whenever installed. Bricklayers' scaffolds should have handrails, toeboards, and wire-mesh side screens. Scaffold floor planks should be laid close together to prevent objects falling through, and all small tools and materials should be removed from them when men are not at work.

Swinging scaffolds should always be lashed to prevent serious lateral motion. Scaffolds should have overhead protection from work high above them.

Workmen should not be permitted underneath scaffolds. The passageways under scaffolds should be effectively covered with roofs or sheds. Sidewalk sheds should be solid and wide, with high wire-mesh screens at their outer edges. Unusually high buildings should have broad and substantial secondary protective plank platforms at various heights to intercept falling brick and implements.

All hoist openings should be fenced in solid with high entrance gates. No passengers should be allowed on hoists. Only a specified number of passengers should be allowed on workmen's elevators.

Hoists should be frequently inspected by experts, particularly with regard to cables. Cable sheaves should be of ample size. All hoist cages should have solid sides 6 ft. high, should be covered, and should have effective safety devices to prevent falling.

Heavy and massive material should be hoisted outside the building and never through shafts or stairways. Derricks should be abundantly strong for the heaviest possible loads and should be equipped with ratchets and pawls and effective brake mechanisms. The hoisting-signal system must be positive and reliable under all circumstances; a code of two strokes of the bell to hoist, three to lower, and one to stop is recommended because an accidental single stroke can do no harm.

Good light should be maintained. Floors, and especially passageways, should be kept clear. Warning signs should be placed at all dangerous points. Temporary handrails and wooden treads should be provided for the stairways. Screens should be erected for the protection of the public. Loose light material should be kept off the roof, especially during high winds. Cutting tools for steel and concrete should have handles to prevent the users from accidental blows. All projecting nails and sharp points should be removed from woodwork, boards and planks.

The great importance of constant care and precaution should be impressed on all superintendents, foremen and workmen.

Maintenance and Treatment of Smooth Pavements

IN the construction of smooth pavements in the large cities due consideration must be given to the cost, local conditions—both as to climate and sources of road materials—and to traffic. These factors have received careful study during the past few years on the part of engineers, but the problems of maintenance that arise in keeping such pavements in repair have not, in the opinion of Mr. W. L. Hempelmann, of St. Louis, received the consideration that their importance warrants. With the view of offering some data of value from the experience met with in St. Louis in this class of work, Mr. Hempelmann discussed the question of maintenance and treatment of smooth pavements in a paper presented before the Illinois Society of Engineers and Surveyors, from which the following notes are taken.

Mr. Hempelmann calls attention to the fact that irrespective of the construction, any pavement will need repairs in time, whether from wear and tear, expansion and contraction troubles or the improper repair of excavations made by service corporations and plumbers.

In the following discussion smooth pavements include asphalt, bitulithic and creosoted wood-block pavements.

Method of Repair

Everyone interested in the maintenance of bituminous pavements is familiar with the asphalt-patching gang, the necessary equipment and the manner in which repairs are made. The most common means of repairing an asphalt or bitulithic pavement are by the method of "cutting out and plugging in." To do this properly and in a satisfactory fashion requires more attention to details than the casual observer would believe. The general procedure in this work is that of trimming and painting the joint, followed by tamping or rolling the hot asphaltic top mixture into the prepared depression. A careful examination of such a pavement where patching as described has been done will frequently reveal the fact that the joint between the patch and the old pavement has not been sealed, due occasionally to what is known as a "dirty joint," but generally to carelessness on the part of the laborer in not painting every part of the exposed edge of the depression. This condition is easily observed after a rain, when the sun has dried up the surface of the pavement, the patches being definitely outlined by a wet line.

According to Mr. Hempelmann another source of trouble comes from the pushing or displacement of patches because of the material used. The patching material used on such work should, in his opinion, be as nearly as possible of the same consistency as the old pavement, in order that when the summer's sun warms up the pavement the old and the new material may soften to the same degree. The folly of using a new street mix as patching material in an old pavement has frequently been exemplified. A temperature variation ranging from 5 to 10 deg. below zero to 120 or 130 deg. Fahr. on the surface of the pavement presents a complex problem concerning the proper mixture to be used.

Creeping of Pavement

Under slow-moving, heavy loads in the summer the materials composing the pavement are apt to push or creep, bringing about a wavy or undulating condition of the surface. This condition can frequently be remedied by the use of surface heaters, by the use of which the bumps or high places are softened and all the burned and soft material is scraped off, leaving a clean surface of the old material. Such burning should, in Mr. Hempelmann's opinion, be continued until the burned area will require at least 1 in. of added material to restore the pavement to its proper surface and cross-section. He states that in almost every case it is well to cut a joint at the edge of the burned area 1 in. or 1½ in. deep, in order that the edge of the old pavement may serve as a shoulder for the new material. He recommends that the surface of such burned areas should be made as rough as possible, using a pick or the point of a hoe, so that the old material may serve as a key to mechanically hold the new material in place.

The whole area, in Mr. Hempelmann's opinion, should be liberally sprayed or sprinkled with an adhesive asphaltic cement, to bring about a better union between the old surface and the new material. This method, he states, is economical and when properly done gives entire satisfaction. Its use in St. Louis shows that the cost of making repairs of this kind, including labor, material, roller and fuel, amounts to from 50 to 55 cents per square yard, depending on the conditions; while straight patching in the ordinary way costs from 75 to 95 cents per square yard.

Waterproofing Joints

In Mr. Hempelmann's opinion, in order to obtain the best results, it is absolutely necessary that the joint between the old and new pavement shall be waterproof. The effect of an imperfect joint, or one not properly sealed, is best seen in the late fall or early spring of each year, when by alternate freezing and thawing the moisture in the joint tends to entirely separate the patch from the rest of the pavement. Such a joint, once opened during the winter, will not close in the summer under traffic on account of the dust from the surface finding its way into the small crevices between the patch and the pavement and preventing for all time the amalgamation of the two mixtures.

In the case of mixtures employing larger stone, this open condition of the surface permits moisture to freeze and thaw in the surface section, thus materially aiding in pitting the surface. Steel-tire traffic on such a wet, open surface is exceedingly detrimental, in that the steel grinds or crushes the surface rock much more readily because of the better "grip" it gets on the materials. In the case of motor and steel-tired traffic combined the suction, created by the rapid motion of the former, tends to redistribute the fine particles which are produced. This can be plainly seen when after a heavy shower the fine material from the surface is found at the low point in the grade.

Recognizing water as one of the worst enemies to smooth pavements, Mr. Hempelmann states that in St. Louis the attempt has been made to waterproof asphalt and bitulithic pavements by treating the surfaces. In this work flush-coating or squeegee-coating the last-named pavements has generally been done as a matter of course to "seal the surface." Hand squeegee carts, or pressure wagons designed to evenly distribute the bituminous material with a coating of sand, are generally used for this purpose. In recent years the economy of flush-coating the bitulithic streets under maintenance by contract is evidenced by the fact that a flush-coat gang is one of the regularly equipped maintenance gangs established when repairs are begun after the winter. The thin coat on the surface obtained by this treatment performs a double duty. It tends to waterproof the surface, by filling all the surface voids, and, with the sand, forms a thin cushion coat on the surface, taking the wear off the pavement proper. In other words, the object has been to build up the pavement by the judicious application of flush coats, rather than permit the pavement to wear down under traffic. According to Mr. Hempelmann, under the traffic conditions in St. Louis such a flush coat wears at least a year. Using tar at 7¼ cents per gallon and applying it by means of pressure wagons, he states that the total flush-coat cost on bitulithic pavements during the summer of 1912, including tar, sand, teams and labor, was about 2½ cents per square yard.

Treating Asphalt and Wood-Block Pavements

In treating asphalt pavements in St. Louis the same reasoning was applied. Some of these pavements were oiled and covered with sand at a cost of about one cent per square yard for material, covering and applying. Mr. Hempelmann states that in treating an old pavement it was thought that the oil treatment would help keep the water out of the pavement and at the same time tend to give new life to the bitumen in the pavement. This thin cushion coat on the surface plays an important part in the wearing of such pavement during the winter months, when chains are attached to the driving wheels of automobiles, the pounding of these chains having the same effect as so many trip-hammers passing over the pavement. This thin layer takes care of the added wear. It has been the practice in St. Louis for the last three years to oil and sand the wood-block thoroughfares. This is largely a treatment for slipperiness, and, according to Mr. Hempelmann, was evolved gradually. In this treatment sand or sharp grit was first spread over the surface of such pavements. Most of the sand was soon found in the gutters, blown to the side by the rapidly moving motor cars and by the wind. As a result the benefits derived from such a treatment were very short lived.

Oiled Sand

Next, oiled sand was tried, the oil and sand being mixed in asphalt-mixing pans and spread over the surface from wagons. Mr. Hempelmann states that this method was slow, expensive and unsatisfactory, since the sand had to be heated and dried to mix with the oil, and when this warm material was hauled to the street the bottom of the load was extremely soggy because of the oil which percolated between the particles of sand and collected near the bottom. As a result the uniform spreading of this soggy material was impossible. At the suggestion of Mr. J. C. Travilla, street commissioner, the oil was first spread on the wood-block surface and then covered with sand. This method proved very satisfactory and was economical, costing about 1 cent per square yard for oil, sand and labor. For this work about ⅛ gallon of oil per square yard of pavement was applied, using a pressure wagon for distribution. Such a treatment lasts through the winter and helps to waterproof the surface.

AN interesting statement on the results that have attended the erection of many-storeyed buildings in New York has been made by the chief assessment authority of that city, Mr. Lawson Purdy, at the request of the City Council of Toronto. Mr. Purdy says that these high buildings have benefited no one, not even the landowners, and that they have brought untold harm to tens of thousands of people by compelling them to perform their work in rooms far removed from daylight and fresh air. The Council's request for information on the subject was made in view of certain applications received for the erection of some lofty structures in Toronto.

DANGEROUS roof tanks continue to claim their victims. Commenting on this question, the Engineering Record says that last autumn one of these tanks on the roof of a factory in Pittsburg plunged down through the building for several storeys, killing three employees and injuring twenty-one more, some of them seriously. In another case the upper part of a building in Philadelphia collapsed killing two men and injuring two others. There is some uncertainty in this case whether the collapse was caused by the overloading of the top floor or to the giving way of the supports of the roof tank. It is certain, however, that the fall of the tank added greatly to the extent of the damage. Accidents like these show that it is time for municipal authorities to recognize that there is just as much danger in a roof tank filled with water as in a boiler filled with steam in the basement.

According to the New York Times an engineer named Wm. B. Fuller, who was in charge of the construction of a dam at Santa Rosalia, Mexico, was kidnapped recently by bandits and is being held for $20,000 ransom. If the Mexican bandits ever transfer their activities to Canada they will have to lower their scale of fees. From our viewpoint twenty thousand is an unreasonable price to place upon the head of a construction engineer.

The Corrosion of Pipe Lines

By B. R. Parkinson, M.I.M.E.

ONE is surprised to find, in conversation with Gas and Water Engineers, particularly the former, the extreme views which obtain on the question of cast iron versus wrought iron or steel, in regard to life and durability. Artificial gas engineers, working with very low pressures, and water engineers, who live in terror of burst mains in a frost-bound soil, regard the innovation of the wrought material with the greatest apprehension. Whatever coating may be applied for its protection, and however many thicknesses of wrapping may encase it, they consider that the innate tendency of the metal to corrode will assert itself, and that right early.

On the other hand, and in close proximity, we have Natural Gas Engineer, working with very high pressures, who entirely eschew cast iron. They drop their wrought or steel pipes into the ground, without either coating or wrapping, and at a comparatively shallow depth; the question of life has no terrors for them, for they claim sufficient number of years experience to demonstrate that the material is one that makes no ungainly haste toward corruption. Parenthetically, it has always been a mystery to the writer, as a Gas Engineer, why steel pipes should almost always be used for very high pressures, and yet not considered good enough for low.

Covering Advocated

But surely there is a mean to be struck between the extreme views of those who have not used steel or wrought iron, and the extreme practice of those who have. The present article, written by one who frankly favours steel, is designed chiefly to draw attention to the question of protective covering.

Metal for metal, there is not much to choose between the inherent corrosive tendencies of cast iron, wrought iron and mild steel. The reputation of cast iron, in the matter of durability, arises partly from its thickness, but chiefly from the natural skin, chemically formed from the silica in the sand in which it is moulded. This gives a natural protective coating. In the cases of wrought iron and steel there is mill scale, which has to some extent the same effect, but not with the same regularity. (An interesting article on the subject of mill scale appeared in the Contract Record of April 2nd, 1913).

The above remarks are corroborated by some notes taken from one of the scientific publications and recently quoted in an American journal:

> "The behavior of cast and wrought-iron tubes during rusting is adequately explained by the electrolytic theory of corrosion. A number of samples of cast-iron, wrought iron and mild steel tubes have been examined for corrosion by means of the Ferroxyl reagent. The results show that the mechanism of the rusting is the same in each case, but because of the higher content of impurities the initial rate of corrosion is highest in the case of the cast-iron tube. Local attack is due to faults in the surface of the tube, and in this connection the cast-iron tube has an advantage over the wrought-iron tube, since its cast skin is less liable to injury than the oxidized layer on the surface of the wrought-iron tube. A wrought-iron tube without surface defects is much less liable to rust than a cast iron tube."

As it is easy to find both opinions and tests which favor either side of the controversy between the two metals, it remains a reasonable proposition that wrought or steel pipes, having thinner walls than those of cast-iron, should be supplemented by an artificial covering. If Natural Gas men can put wrought iron and steel tubes in the ground entirely uncovered, and claim fifteen years life, and no corrosion, surely a good coating and wrapping applied to the same class of pipe will give us a very serious rival to cast iron, in the matter of duration.

Mummies of Egypt

In fact, where cast iron can claim in some cases an experience of fifty to one hundred years, we have only to point to the mummies of Egypt to show that a covering of cloth soaked in bitumen, will conserve for ages. The exclusion of air and moisture from organic matter, for thousand of years, is a test of efficiency which may be accepted as a warrant for the same method applied to an inorganic substance, whose life is scarcely required for so long a period. That the hessian covered, or burlapped steel tube, has already inspired confidence and hope in many quarters, may be gathered from the following extract from a New Zealand letter:

"The south end of the City of ——— is built on low lying swampy ground which is particularly destructive to cast iron pipes. The soil is composed chiefly of decaying vegetable matter, and the district is adjacent to the sea, only a few inches above sea water level. A hole dug into the soil instantly fills with swampy water almost up to the surface, so that trenching and mainlaying under these conditions is a particularly awkward matter. The cast iron pipes which were originally laid through these flats, were a source of endless trouble, for after a time they become quite soft —almost as soft as cheese—so that a hole could be worked right through the shell with an ordinary lead pencil. Consequently the whole of them had to be exhumed and wrapped steel tubes laid in their places."

Gas Mains not Coated Inside

While writing of pipes coated and wrapped, it may be useful to give a hint to gas engineers in regard to their specifications. For water it is usual to coat pipes inside and out, and unless specified otherwise, the same article may be supplied for gas. The result is that the internal coating is attacked by the gas (particularly carburetted water gas), and carried over to block the drip wells. It is also essential, before jointing, to remove (with a wire brush or scraper) the coating on the outside of the spigot end, and any that may have got into the socket; otherwise by attacking this the gas will find its way out at the joints, and leakage will result. Many engineers have been caught in this way when first using steel tubes.

The Coolgardie Steel Main

In discussing the subject of pipe corrosion generally, and from a water engineer's point of view in particular, it is difficult to avoid reference to the famous case of the Australian Coolgardie main. This was a 350-mile line of 30-inch pipe, built on site on the lock-bar principle. The pipes were not burlapped, and moreover the coating solution was applied, not at the mills, but also on site, after the metal had been exposed in transit. This is an important point, as whatever cleaning of the metallic surface may have been adopted, the result would not be likely to equal that of a coating applied immediately after the manufacture, under cover. Furthermore, the line was laid in a soil containing salts, which rapidly attack steel or iron. Of the 350-mile line, a length of 85 miles, which had been treated with a solution of questionable specification (differing from the remainder) showed early signs of corrosion, and the whole case has since been the subject of reports by experts which have drawn the attention of all engineers who are interested in the subject. It suffices for the purpose of the present article to give such extracts as will show that the resultant conclusions prove nothing adverse to steel as compared with cast iron, and certainly have no bearing on the wrapped steel proposition, for the reason that the Coolgardie main was not wrapped.

Destructive Soils

Extract from report in 1905 by Mr. Edward Simpson, Government Mineralogist for Western Australia: "This table shows that the whole of the soils examined contained soluble salts, varying in amount from 0.1 to 1.33 per cent. Corrosion more or less intense is therefore to be expected at all the points from which the samples were taken. This corrosion will be entirely prevented by the asphaltic covering where intact. Wherever it is chipped or scratched the pipe will be open to attack. The attack will vary with the moisture of the soil, and nature of the soluble salts therein, and the attack will increase with lack of homogeniety of the steel."

Extract from report in 1908 by Mr. W. C. Reynoldson, Chief Engineer, Goldfields Water Supply, Perth, W. Australia:—

"Generally the cast iron portions (valves and specials and Venturi meters) are more tuberculated and in a worse condition than the steel main itself."

Internal Corrosion

The matter of internal corrosion, although irrelevant to the question of outside covering, is of such interest as to require some notice also. The anxiety on this score was even greater than on that of external corrosion. It is admitted, in Mr. Reynoldson's report that "the Coolgardie supply contains more chloride of sodium than the water supplied to cities and towns generally. This salt is on the electrolysis theory, considered to be one of the most active agents of corrosion." To this is added the remark by Mr. E. A. Mann, Government Analyst of W. Australia, that "the corrosive quality of the water may be due not so much to the high proportion of corrosive salts, as to the absence of protective hardness." The ultimate remedy adopted to make good this leak of 'protective hardness' was the treatment of the water with milk of lime in the initial reservoir following a de-aerating process for which special plant was required.

Comparison with Cast Iron

Under the heading of "Corrosion in other Australian pipe lines" references are made in the reports to particulars of a 12-inch cast iron main of the Metropolitan Water Works Board, Perth, given by Mr. Faulkner, the Superintending Engineer. "The pipe was completely encrusted with tubercles to a thickness varying from one inch to one and a-half inches. The whole surface of the metal under the tubercles, although retaining its original shape, had been converted, to a depth of nearly [illegible] inch to a substance of the resemblance and softness of plumbago." Referring to the same 12-inch cast iron main, Mr. E. A. Mann reports as follows: "It was long thought that cast iron was more resistant than steel, but the graphitic layer in corroded cast iron pipes, has served, in many cases, to conceal the real state of affairs, hiding the fact that the metal was deeply corroded when it was apparently unattacked."

Further remarks on the relative corrosion of iron and steel occur in the report of Mr. E. S. Hume, Chief Mechanical Engineer, West Australian Railways as follows:—"It would appear from experiments that mild steel may now be considered a correct material to use for the manufacture of water mains."

Commenting on the whole of the above mentioned reports the Engineering News of New York remarks: "Some of our readers will be particularly interested in the portions of our abstract dealing with the relative powers of cast iron and steel to resist corrosion and particularly in the testimony to the effect that mild steel is fully as resistant as cast iron, while the resistance of the latter, as heretofore held by many, is often more apparent than real."

Treatment of Water

Gas Engineers will not be concerned with the problem of internal corrosion, but for Water Engineers the following will be of interest as giving results of the lime treatment.

In the seventh annual report of the Goldfields Water Supply Administration, 1910, Mr. W. C. Reynoldson refers to the progress of operations for remedying internal corrosion in the following paragraph. "In view of the very complete protection afforded the Kanowna main by lime treatment, it is anticipated that the removal and complete exclusion of air as further recommended by the British experts in addition to the lime treatment and keeping the main fully engaged will not be found necessary."

Again in the eight Annual Report, 1911, Mr. Reynoldson remarks: "A temporary lime treatment plant was put into operation at the end of October last year, and the water has since been treated with lime continuously. Analyses indicate that about 20 per cent. of the lime added to the water is carried through to Kalgoorlie with beneficial results."

The case of Coolgardie has been used more than any other throughout the world as an argument against steel as a material for pipes, and no apology need therefore be made for extracting from the reports on the undertaking, certain very salient facts which tend to more than restore the balance.

The Highest Chimney in the World

A chimney of unprecedented size has been built at the smelter plant of the Boston and Montana Consolidated Copper and Silver Mining Company, near Great Falls, Montana. It is 506 ft. high above the top of the foundation ring, and 50 ft. in interior diameter at the top. It is the highest in the world by about 40 ft., and the highest in the United States by 140 ft., the Eastman Kodak chimney being 366 ft. high, and the Orford Copper Company's chimney being 365 ft. Its discharge capacity is 4,000,000 cu. ft. of gases per minute, with a draft of 3¾ in. water expected with gases at 600 deg. F. average. The height was governed solely by the draft requirements, and not by the desideratum of discharging high enough in the air to prevent creation of a nuisance. This latter requirement is met by the existing stack, which is but 186 ft. high, the city of Great Falls being 500 ft. lower than the tableland, and the valley being 250 ft. to 300 ft. lower.

The Principles of Scientific Building Construction

SCIENTIFIC building construction is based on mechanical laws which, to insure the stability of structures raised by them, should be well understood by architects, although there are some of the advanced Aesthetic school who deny that architectural form has anything to do with construction, says our London contemporary, The Building News, in a timely article which contains much of interest to the Canadian field. An unprejudiced observer will, however, admit that the growth of Mediaeval architecture from Norman to Perpendicular was really progress in advanced methods of building discovered as the works were carried on. The fact, however, remains that, although in the golden age of building the architect was chief workman, at present his function is to decorate a structure the framework of which has been put together for him by a quantity surveyor, or possibly an expert in steel-frame construction. Decoration now consists in the selection and combination of pretty bits from the works of architects long since deceased. These bits were originally construction decorated; but in taking them from their surroundings they are no longer constructive elements in any sense of the word. To take the simplest case, in the Parthenon and such buildings, columns and entablatures were structural necessities—there would be no building without them; but now such columns and entablatures are copied and stuck up against walls because they look pretty, and as they have no structural function whatever to perform, they are useless and expensive excrescences which the building would be better without. Columns and entablatures were something to the ancient Greeks; but now that they have ceased to be constructive elements, they should be eschewed, and some attempt made to create an architecture which shall be really an art, and not a fashion. It is positively grotesque to see men in this twentieth century turning over the remains of Vitruvius, Palladio, and others with a view to the selection and combination of such portions of their works as they may consider aesthethic. These supreme efforts at manufacturing shams are successful for a time—the public is so woefully ignorant of all that pertains to architecture; but after a momentary success these swindles are consigned to everlasting contempt. To build well, it is therefore necessary that the architect should honestly asknowledge the constructional requirements of the elements with which he has to deal, and endeavor to satisfy them, carefully eschewing columns, cornices, pediments, and all such second-hand properties gathered from the exuviae of buildings in other latitudes and of other times.

Stone or Brick

The first problem that confronts the man who would build is: Of what shall the walls be—stone or brick? This must be solved by considering what materials are found in that locality, and deciding whether they shall be used, or others of a more suitable, and perhaps cheaper, kind be imported. In olden times houses were built with local materials, for there were no others to be obtained at a reasonable rate. Hence, in a stone country stone was used, in a clay country brick, and in a wooded district oak; and these materials necessitated modes of construction and architectural forms peculiar to themselves; but now that steamers and railways have annihilated distance, we are privileged to see oolite cottages in sandstone counties, "rag" cottages on clay, and oak-framed structures where oak is not grown.

If stone is used some knowledge of its properties is necessary. It may be quarried in an igneous, or aqueous, formation, the first being fire-formed, and the last sedimentary deposit in water. As this is not a geological treatise, it must suffice to refer briefly to the stones generally used in building. The fire-formed rocks are granite and basalt, sometimes called whinstone; and the water-formed sandstones and limestones.

To Determine the Value of a Building Stone

What is a sure guide to the value of a building stone? An inspection of some building in which the stone has been exposed for centuries is the only infallible guide to its weathering properties, and all expert reports, diagnosis, analysis, and what not must be set aside for the knowledge gained in this way. This becomes obvious when it is known that the chemical analyses of chalk and carboniferous limestone are exactly alike. Yet chalk will burst to pieces if exposed to one winter's frost, while carboniferous limestone will show tool-marks after the lapse of 600 and 700 years as fresh as the day they were worked. If a stone is impermeable by water, it is clear that it is a good weather stone; but if it absorbs any, its durability cannot be inferred from its properties in this respect, as compared with other stones, which are more or less absorbent. The capacity of stones for absorbing water may be judged from the fact that one limestone will take up no water after twenty-four hours' immersion, when another, from a different formation, will absorb no less than eleven pints to the cubic foot, both stones being "bone dry" when tested in the first instance. The weathering properties of a stone are not, however, everything; its suitability for any building in the matter of sound construction and cost in working also press for consideration. Some quarries show a face as if built up with regular courses for a few inches to nearly a foot thick. These are ideal stones for building, as they can be quarried and laid in walls with a minimum of labor, and the bond secured with little trouble. Where the cost of working a stone is excessive, brick quoins and dressings are frequently used with rubble-walling; but this never looks well, for brick is softer than stone, and the dressings should convey the idea of being of a harder material than the walling, the angles of which they are meant to protect. Cut-stone quoins, and door and window jambs of the same material, with brick walling, always look well. A cavity, or a coat of cement on the outside, will make the inside of a wall proof against rain; but nothing will stop the deposit of moisture on the inside of a wall if it is faced with non-porous material. Hence, when a wall is of stone outside, it should be faced with absorbent brick inside, or an "unaccountable" dampness, or "sweating" of the wall will be the result. Dampness rising from the foundation is, of course, best dealt with by using natural asphalte; and if the building is a mansion, the whole space inside the walls should be covered with asphalt too, for cement concrete is not damp-proof. Should it be decided to build wholly with brick, there must be "facings" and "backings"; both should be of the same thickness, to insure perfect bonding, and they must be well shaped, hard, and well burned. Bats, except as closers, should be avoided. The practice of grouting brick walls at every fourth course should be avoided, for it encourages careless bricklaying; it is evident that if the courses are well flushed with mortar, as they should be, there will be no room for grout.

Prime Factors in Good Bricklaying

Keeping the courses level, the faces plumb, and the angles properly bounded with the correct closers, are all prime necessities to good brickwork. Some bricks are so sandy that they will not keep out rain; others so clayey that they cannot stand frost. The first must be cemented, or weather-slated, and there is no help for the latter but to cut them out and replace them with others. The goodness of a brick is tested by striking it sharply against another. If it gives a clear metallic ring, it is sound and well burned; if it does not, it should be rejected. Bricks are generally dry when tested in this way; but if they are tested after being soaked for twelve hours in water, unsuspected weaknesses may be discovered in them, and this applies especially to moulded and ornamental bricks. An important question in the building of walls still remains to be settled—namely, the kind of lime that shall be used for making mortar. That the sand shall be sharp and clean goes without saying; but that, for brickwork, it shall pass through a 30 and be caught in a 40 sieve is not so well known. For stonework, coarser sands may be used.

Sand may be pure silica, pure limestone, or mixtures of either with other substances. In a mill, continued grinding wears the angles of the grains down, so that the sharpness specified for by the architect is frequently ground away during the process of mortar-making. The lime used may be pure or clayey. The former is made from chalk and the pure limestones; the latter from limestones containing up to 25 per cent. of clay. The behavior of these limes when treated with water is very different. The pure lime swells up at once, gets intensely hot, and falls to a white powder rapidly; it also increases in bulk to nearly twice that of the unslaked lime. Its color is always pure white. A heap of pure lime-mortar may be left for months without change through its mass, a skin only of carbonate forming on the outside. The next point to be considered is, shall concrete be used in the foundations or not? If the bottom is stiff clay, gravel, or sand that will not shift, the wall, whether of brick or stone, may be carried up directly from it, provided that it is not within three feet of the surface—a depth necessary to place it below the reach of meteorological influences. It is usual to put footings to a wall, and the lowest course of these is generally twice the width of the wall at the ground-level, the object of this being to spread the weight of the superstructure over a larger area, and reduce the pressure on each square foot of the foundation by one-half. In some cases a good foundation can only be obtained by going down; in others, a widening of comparatively shallow foundations will be a better plan. The builders in any locality are generally reliable guides as to the safety of the ground on which it is intended to build. Building on made ground, or on virgin soil and made ground, is dangerous. In this case the foundations should be entrusted to men of experience in such work, and all theoretical opinions carefully eschewed, for a slight lapse in this case may lead to ruin.

When there is a hard bottom to build on, concrete is not necessary, and it need not be used unless it proves to be a cheaper material than brick or stonework to fill the trenches. Formerly it was common to build wood bond-timbers into walls; but if the walls are damp, these timbers will rot in a few years. Hoop-iron bond is also used, and in a damp wall it will soon perish, while in a dry wall it will be found sound and bright even after fifty years. This bond ties the walls longitudinally; but if several rows are put on the same course they damage the wall in this way—if it falls over, it breaks up into sections along the lines of the hoop-iron bond, but as it is no part of the duty of a wall to fall over in this way, the bond, after all, does the wall no harm. Hoop-iron is specially valuable for tying cross partitions to a main wall. The "wastes" from a house consist of the discharge from water-closets, bath, lavatory, housemaid's sinks, and scullery sinks, and the object of the builder should be to get rid of these wastes, or any gases arising from them, as soon as possible. The proper way to fix earthenware drains, and lead or other pipes, to effect this object, has been treated so exhaustively by writers who understand the subject, as well as by those who did not, it is worn threadbare, and a reference to it is even a greater nuisance than the sewage itself. Amateur builders of all kinds, sanitary engineers with curious qualifications, and some doctors with none, have done their best, and with success, to harrow the feelings of the public, create a scare, and make life miserable, about the disposal of matter declared to be a "deadly poison," though a few minutes before, it, and its "gases," were carried about in the human body for hours, if not days, without ill-effects.

A private house is not a public sewer, and it would be impossible to conceive of a water-closet or bathroom with an atmosphere so completely exhausted of its oxygen as to be dangerous. Unpleasant smells are not necessarily poisonous. There is no mystery about them, or about the gases which give rise to them; they are well known to chemists, and they may be breathed with impunity when diluted with oxygen. There are two very important points in house-drainage which are usually overlooked in hunting after gases—namely, the necessity for a periodical cleaning of the insides of soil and waste-pipes, the scraping of fireclay drains, and their automatic flushing at least once every twelve hours. If soil-pipes, waste-pipes, and drains are kept clean inside, and they are efficiently disconnected from any main sewer, it is obvious that, with traps or without them, no sewage-gases can ever get into the house.

DETAILS of the principal members of the Quebec Bridge are now available. The main span is 1,800 ft. long. The top chord members of the cantilevers will consists of double lines of 16-in. I-bars. The bottom chords will have the enormous dimensions of 7 ft. in height by 10 ft. wide. The length from panel point to panel point will be 86 feet; each full panel of the bottom chord for one truss will weigh 200 tons. Each cast iron base for the towers will weigh 500 tons. The stringers reaching from panel point to panel point are massive plate girders 10 ft. in depth, each weighing about 60 tons.

Advantages and Disadvantages of Reinforced Concrete*

By Percy J. Waldram

CONCRETE is a material which has received, during the last few years, a considerable amount of very skilful and successful advertising. The effect of this has been enhanced by the intricate nature of the mathematics and formulae by means of which it is commonly supposed to be calculated, and it is popularly regarded as a mysterious and wonderful material, which is superior to the natural laws of structural mechanics—enormously strong, extremely cheap, and eminently suitable to almost every possible form of construction from a factory to a stationary cabinet. It is, in fact, far too frequently credited with the almost miraculous powers with which electricity was popularly invested some years ago, before its physical and economic limitations became generally known. In many ways electricity has exceeded the expectations which were formed of it, but we still use a little coal and oil for various purposes. Reinforced concrete has possibly similar unexpected triumphs awaiting it, but steel, wood, brick, and stone are by no means obsolete yet. It would appear to be essentially the province of surveyors to form a fair and businesslike estimation of its advantages, because, without going into intricate calculations it is possible to arrive at a sufficient and correct opinion of its general physical character and of the conditions essential to its proper production, and when these are clearly grasped the problem resolves itself into a matter of ordinary valuation. The general physical properties of the material are fairly summed up in its title. It is concrete reinforced. The steel bones and tendons which we supply to the concrete flesh enable it to overcome that want of tensile strength which previously restricted its use to situations in which it could act in compression only—as in arches, arching floors, walls, footings, etc. But the presence of reinforcement does not make any very great difference to the nature of the concrete itself. The latter still remains an active partner in the firm, and the steel must work pari passu with it or dissolve partnership; and unless the steel reinforcement is made capable of carrying on the whole of the work, with the concrete acting merely as fireproofing material, dissolution of partnership means ruin. Hence even in beams which are reinforced in compression we are constantly hampered in design by the capabilities of the concrete, which unfortunately are not very high; and in spite of all the important structural advantages resulting from a monolithic form of construction in which the strength of each part of a structure enhances that of its neighbours, reinforced concrete is necessarily heavy and weak for its size as compared with steel or wood. This disadvantage is partially balanced by its almost perfect durability, which enables us to utilise a greater proportion of its ultimate strength than is the case with more perishable materials. But in all cases where severe stresses and the dead weight of long spans are involved, it is useless to expect from it the same strength that we obtain from wood or steel at the same cost. There are, however, situations where it would, for other reasons, pay to use the weaker material. When properly designed and properly made in situations where it is suitable, it is rotproof, verminproof, fire-resisting, almost waterproof, and grows stronger with age instead of decaying. It can also be readily moulded to any given form, and in entire structures it is wonderfully monolithic, a very considerable advantage in bad foundations. But at the same time it is

Not a Material to be Used Without Accurate Knowledge of its Limitations.

It must be designed with skill, made with more than customary care, carefully nursed during its infancy, and protected during the whole of its lifetime from agencies which are deleterious to cement such as impermeating oils and acids. In some cases these disadvantages are immaterial, and it is the peculiar province of the surveyor to estimate them. In all situations where plain concrete, brick work, or masonry would customarily be employed it can be expected to do the same work with far less bulk of material. But on the other hand, its use invariably entails extra expenditure in casing, which may or may not outweigh the saving of material. A retaining wall, for instance, in reinforced concrete will do the same work as a solid brick or concrete gravity wall at a fraction of the cost; but in ordinary dwelling-house solid walls, where there is not much thickness which can properly be saved, reinforced concrete and its casing must be expected to prove more expensive than brick or stone. On account of the great difference between the stiffness of steel and concrete, as well as between their respective strengths, it is a matter of no small mathematical difficulty to devise formulae which will tell us accurately how such an ill-matched team are going to pull together upon any given load, and what work we can safely entrust to them without running the risk of the too willing steel being overworked, or setting a pace which the concrete cannot keep up with. Even at the present time, after engineering scientists all over the world have been engaged for years upon the subject, there are still problems which no textbooks meet. Many minds are, however, at work, endeavouring on the one hand to complete and standardise our knowledge, and on the other to simplify the mathematics involved.

Reinforced concrete suffers, and suffers badly, from the incubus of tedious and intricate calculations, and it is pleased to be able to say that the results given by all formulae can be plotted to curves. When these are drawn to large scale the slightest inaccuracy in calculating them is seen in some irregularity in the sweep of the curve. When they are used instead of the formulae, the designer's task is reduced to that of selecting values from a set of diagrams, in percisely the same way that he now selects a joist or the properties of a stanchion from a table of British rolled sections. In my own office we have almost completely eliminated the necessity for using the long standard formulae, having plotted them all on diagrams, one of the most useful of which is given in Appendix A. The saving of time and trouble effected by their use is enormous, but what is far more important is the notable gain in accuracy. If a draughtsman has a long and intricate formula to work to, the chances of error are far greater than if he has merely to take a value from a plotted curve. Another important and unexpected advantage which results from the substitution of curves for tedious mathematics is the rapidity with which the designer can grasp the possibilities of a problem, can compare reinforced concrete with other materials, and, if it is found suitable, select the particular form in which it will give the results which combine efficiency and economy. In a material which has a high ratio of dead weight to strength it is frequently only possible to secure a proper factor of safety by eliminating all superfluous bulk. The subject of design in reinforced concrete is being extensively taught in technical institutions and it is to be hoped that as the supply of skilled designers increases the disadvantage of excessive mathematics will disappear. The necessity for skilled labour in construction is often considered to discount the use of reinforced concrete in remote country districts, where it would never pay to send down specialist workmen. I would suggest, however, that it is rather a matter of the skilful supervision of the structural ability which is to be found in country and estate workmen. The more remote a district is from large centres of population the more multifarious are the demands made upon the intelligence and ability of the local workmen. Opinions probably differ on the point, but personally I have always found country workmen remarkably intelligent, and can see no reason why a good estate mason should not very quickly be taught all that is required to make, or to supervise the making of good reinforced concrete. If he is given good materials and clear drawings, all that is required is a somewhat unusually rigid attention to comparatively simple rules, which can easily be typed on a page or two of foolscap, or stated in his specification. Any man who is capable of mixing and making really good concrete, who can read, understand, and carry out drawings intelligently, and who can be trusted loyally to adhere to instructions without varying them according to his own ideas, possesses all the necessary capabilities; but he cannot be expected to turn out good work in a material with regard to which he has no previous knowledge or traditional skill unless his preliminary instructions are clear, definite, and complete. The necessity for skilled labour in the workman, and highly skilled intelligence in the foreman, is so often advanced as an argument against the execution of work, otherwise than by a specialist firm, that I would venture to draw attention to a few practical points upon which this argument is largely based. They are seldom emphasised in text-books, and being comparatively immaterial in the making of plain concrete, their vital importance in reinforced work is apt to be overlooked.

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Materials

The stereotyped clause that "all materials should be the best of their respective kinds" is not one to be lightly interpreted. They must be of the very best. If the sand requires washing, it is far better out of the work altogether. Washing often removes those finer particles which are essential to a strong dense mixture. The aeration of cement should never be necessary. If it is of the proper quality and sufficiently ground it will have been properly aerated by the manufacturer; in which case further aeration will only tend to render it inert. Even if kept too long in sacks it will be found to cake. Cement should be slow or at least medium setting, and should pass the British standard tests. It should be recollected that comprehensive cement testing can only be carried out by an experienced specialist in a properly equipped and properly constructed laboratory. It is generally better to have the guarantee of a first class manufacturer, supplemented by crushing tests on concrete cubes, than to trust to testing deliveries on the site. Unless the tester is experienced and his testing room is perfect, he must expect erratic results if he attempts anything beyond the simple tests for fineness and setting. The aggregate should consist of large, small, and medium-sized particles; the largest of which will easily pass between the reinforcing bars.

Grading and Proportioning

The presence of small voids in ordinary concrete may be quite harmless, but in reinforced concerte every effort must be made to eliminate them by careful mixing and thorough tamping. They may be the means whereby damp may enter and rust the rods, causing them to swell and burst off the cover. In beams there are high stresses concentrated on very small areas of cross-section, in which the presence of a void may be very serious. Voids may also interfere with the adhesion between metal and reinforcement at a vital point. It is therefore necessary to fix the proportions of the aggregate, sand, and cement, with some care, so that the interstices of the larger materials may be exactly filled by the smaller, and a thoroughly dense mixture secured. The deliveries of aggregate should be tested from time to time, and if necessary the proportions should be varied. The amount of smaller material necesary to fill up the voids in larger aggregate, and the proportion of voids in sand which must be filled with cement, can easily be obtained by placing a measured quantity of the larger material in a water-tight vessel, and filling in measured quantities of water until it becomes water-logged. For all practical purposes this can be done as accurately by an intelligent ganger with a pail and a pint pot as by a chemist with accurate measuring instruments and the whole of the metric scale at his disposal. The shrinkage which takes place in the volume of material when wetted must be remembered when estimating the volume necessary to fill the interstices of material of larger size. Ballast aggregate should never be assumed to possess the correct amount of sand. The latter should be screened out, and the correct porportion added back.

Steel

There are on the market many types of patent reinforcement and varieties of hard carbon steels. The advisability of adopting any of them in a given situation is a complicated question. For ordinary work ordinary merchant bars of British standard steel are difficult to beat.

Bending

If reinforcements are, as they should be, kept as small as possible, all ordinary bendings can be done on the site by means of bending irons and a few iron pegs fixed into a wooden baulk. The only machine necessary for ordinary work is an efficient pair of shears. Loose scale should be cleaned off with a wire brush, but a slight coating of rust is not disadvantageous.

Casings and Falsework

These should be made of stout well-seasoned wood put together with a view to stolid firmness whilst the concrete is setting, and afterwards coming away easily without jarring or hammering. Unless concrete is kept absolutely quiet and still until it hardens, the process of setting will be seriously interfered with or arrested altogether. For this [illegible]

[illegible] casings consists of outside bolts and straps, but the next best method is by square cut nails with the heads left projecting half an inch, so that they can easily be drawn by the leverage of a claw-hammer or a split crowbar. Screws are apt to rust in badly, however well they may be greased. It generally pays to plane such parts of the casing as come into contact with the concrete, so that it will come away easily, leaving a smooth finished face. With the same object in view the forms are sometimes oiled. This should be done with care. The oil should be thin and allowed to dry. Most fats and oils are deleterious to cement, but are especially so when the concrete is green.

Mixing and Placing of Concrete

In all cases where the concrete will be heavily stressed in compression it pays to use a rich strong mixture (say 1:1½:3), rather than to make up the deficient strength of a weaker mixture by means of compressive reinforcement, which must always be expensive and uneconomical. When the mixing is done by hand, the sand and cement should be thoroughly mixed first until the colour is a uniform grey, then the aggregate should be added and mixed, and finally the water in measured quantity, the whole being then turned over until it is of uniform consistency. Machine mixing should combine a tipping with a rotary motion, unless the rotating drum is provided with inside blades. A very simple and yet very efficient mixer is a large wooden barrel with a hopper door formed in one end. The barrel is filled about half-full or less, the hopper door is closed, and the barrel rolled along to where the concrete is required, the tapered ends giving the necessary combined pitch and roll to the contents. Experience will soon determine how far the barrel requires to be rolled before the contents are ready for the large aggregate and for the water to be added, and the measuring stations for these are arranged accordingly. The forms and centering should be thoroughly drenched (not merely wetted) before the concrete is filled in.

Nursing of Green Concrete

It is impossible to overrate the importance of keeping the concrete thoroughly wet and perfectly still until setting is complete. It should be kept watered and protected from drying winds and sun for the first week or ten days of hardening, and it should be somebody's particular duty to see to this over week ends and holidays. All sawdust from the making of forms should be carefully preserved for spreading over floors as soon as the surface is hard enough.

Test Cubes

In all large work small test cubes of concrete should be made from each batch of concrete, tamped to the same degree as the concrete in the work, kept under the same atmospheric conditions and tested by crushing. Cubes of 4 in. side or 6 in. cylinders are usually specified, but it is not easy to construct a machine which will crush these. It is far better to have plenty of 3 in. cubes crushed on the site by a simple lever testing-machine made of 11 in. floor joists than to send, at considerable expense, one or two 6 in. cubes to be crushed at the nearest town which possesses a 50-ton testing-machine. All the foregoing precautions are comparatively simple. Usually the difficulty is to get workmen to appreciate their importance. It is a good rule to have one person responsible for each particular matter which needs looking after, provided with clear typewritten instructions as to what he has to see to, and a definite penalty awaiting any carelessness. If the work is small, possibly one man can look after everything, in addition, perhaps, to doing part of the work himself; but two men should never share any one responsibility, however insignificant. Sooner or later both will overlook it and blame the other. We may, however, conclude that if clear large-scale drawings in sufficient detail are supplied to the foreman, with carefully-drawn up instructions, there is no need to consider the necessity for skilled labour to be a matter which should weigh unduly against the use of the material. The chief points in favour of reinforced concrete are:—

(1) Its freedom from decay and its improvement with age;

(2) Its impermeability, which prevents insects and disease germs from harbouring in it.

(3) Its monolithic character.

Its chief disadvantages are:—

(1) Its cost.

(2) Its weight and bulk for a given degree of strength.

(3) The difficulty of making alterations in it, or of strengthening parts which prove to be weak.

Upon these general considerations it is possible to form a sound opinion as to whether in any given situation its use would probably prove advantageous or the reverse. It should be expected to show advantages in efficiency or economy, or both, in situations where:—

(a) Fire risk is a predominant or an important consideration.

(b) Repairs and renewals are expensive, inconvenient, or difficult; or where neglected or unperceived decay is dangerous, as in sea reclammation works, reservoirs, storage tanks, etc.

(c) Where a hard, impervious surface, which can be readily cleaned, means money in the long run; as in the walls, floors, and fittings of farm buildings, and especially of dairies; in storage tanks, grain stores, silos, etc.

(d) Where it can be substituted for plain concrete, or thick masonry, as in retaining walls, foundations rainwater tanks forming the roofs of dairies, water towers, and above ground ensilage silos.

(e) Where considerable repetition reduces the cost of centering and falsework, as in piggeries and cowhouses, and their fittings, mangers, troughs, etc.

(f) In large complete buildings of a straightforward character, such as storage warehouses, especially on poor foundations.

It would be handicapped by its weight, bulk, cost, and by its permanent character where: —

(a) Long spans or heavy loads are involved.

(b) Where steel or timber can be used for the same purposes without disadvantage.

(c) Where the work is small, and there is little or no repetition to enable casings to be reused, as in single cottages.

(d) Where the finished details of the work are not or cannot be settled, or whence a building is only required for a few years. Cutting or altering a reinforced building or pulling it down for re-erection elsewhere are all but impossible.

As a proof of the development which is taking place at the coast it is interesting to note that the value of permits issued at Vancouver for the first three months of the present year eclipse those for the same months in 1912 by over $700,000, the amounts being $3,335,407 in 1912, and $4,072,713 in 1913.

Building Operations in Western Canada

Contributed by F. W. Nicholson, Vancouver

BUILDINGS in Western Canada, and especially in the cities of Vancouver, Victoria and Calgary, have taken a decided turn in construction, planning and general finishings, equalling the later, type of office and apartment house buildings constructed in New York and the eastern cities of the United States and Canada.

Mill construction, which consists of interior timber framing with brick walls and fronts, has given place to reinforced concrete and steel for the constructional part of the building in most up-to-date structures, although in most western cities reinforced concrete work is more extensively used than steel work on account of the difficulty in obtaining constructional steel work in satisfactory time, and also on account of the extra cost entailed in structural steel buildings. Therefore reinforced concrete has been employed in most of the larger buildings in the west, it being designed in many different systems such as the Turner Mushroom System, and the Kahn and Hennebique system. In most instances, round or twisted steel rods are being used as the reinforcing for the concrete.

The front elevations of practically all of the larger buildings have been carried out in terra cotta, although some are faced with faced brick work, with terra cotta dressings, the terra cotta withstanding the rainy season in the western provinces better than face brick work.

Higher Standard for Interior Equipment

In the last three or four years greater attention has been paid to the planning of buildings and other interior finishings. In most instances, high speed electric elevators of the latest design are being employed with larger size elevator cars constructed and fitted up in the most modern style, including the latest type of control and signalling device. The staircases, where built up in reinforced concrete or steel carriages, are generally finished with marble.

Greater use is also being made of the best type of plumbing, heating and electric lighting, and the latest type of fittings for these different trades are being employed.

Many of the largest eastern American firms manufacturing locks, paints, sashes, trim and radiators, are paying a good deal of attention to the western provinces, by sending some of their best travelling men to lay before architects and other clients the latest type of material they are manufacturing for use in the larger buildings in the east. It is noteworthy that their endeavors to introduce different commodities amongst western architects and building contractors have not been in vain. Practically all the latest buildings will be found to have many of the most up-to-date fittings, and in place of wooden floors, so generally used in the buildings of four or five years ago, you will find marble, mosaic and ceramic tiling; also the dadoes of the corridor and lavatories generally are being finished in marble or tile.

The architects responsible for the buildings of the last three years have been paying more attention to the entrance hall-way and elevator hall-way of the different buildings. Instead of the small and cheaply finished hallways of the older type of building, you will find they are beautifully panelled out in marble decorated with well-designed ornamental plaster work to the ceilings. The enclosures for the elevators, both in the entrance hall and different floors throughout the building, are of a more expensive type than was usual a few years ago. Most of the heating plants are being operated by oil, which is found to be cheaper than using coal for the same purpose, as well as saving labor in the stoke-hole most of the engineers responsible for the operation of the heating plants claiming that they can more readily control the heating in the building where an oil plant is installed.

Vancouver and Victoria are two cities in the west of Canada which are building up most rapidly. Vancouver permits last year were over 19½ million dollars, which is very creditable considering that fifteen years ago Vancouver was not reckoned much more than a large village. It is expected that as the country opens up more around these cities, and when the Panama Canal is completed and ready for traffic, Vancouver and Victoria will be reckoned as the two large cities of the West, rivalling San Francisco, and having greater advantages possibly than this great city may claim.

An uneasiness was experienced amongst some building owners about two years ago, when many of the large office buildings now finished were projected, as they expected that their buildings would be depleted of tenants when the newer and more up-to-date structures were completed, but their expectations have not been fulfilled, as it has proven office accommodation is just as difficult to get, and rental prices have not taken any marked downward tendency.

Many new structures are contemplated for the cities of Vancouver and Victoria for 1913-14, and in many instances the architects' plans and specifications are prepared and everything ready to go on with the work, but just as an engine is useless without steam, so these cities of the West are dependent to a large extent upon financial assistance from the eastern provinces and Europe, and owing largely to the unrest in Europe money for building operations is not so readily forthcoming at the present moment, thus delaying many new structures and causing the poor general building contractor a good deal of anxiety, with a tendency among contractors to lower prices to secure contracts to keep their staffs going.

This present financial stringency however, cannot last, and no doubt in a short time, as soon as European affairs are on a more settled basis, financial assistance for building operations in the West of Canada will again be forthcoming, and with the advent of large railroads into Vancouver and more factories, work should be plentiful. There is no doubt the Vancouver of today would appear a very small city if we were only permitted to look ahead five years to the Vancouver of 1918.

BRIDGE efficiency is exemplified in the case of the Superior Avenue viaduct, Cleveland, which has a 332-ft. turntable drawspan. Although it was designed for four-wheel horse cars and is now carrying eight-wheel heavy suburban electric cars, and has been much neglected and abused, it has been in constant service since its erection 33 years ago, without having ever been closed to street traffic for a single day. In recent years it has been widened 2 feet on each side and gaps of as much as 6 inches, due to contraction in cold weather, have existed for weeks at a time without correction. With attention to the track, end bearings and turntable, the bridge is considered good for many years more service. It is estimated that the drawspan has been opened about 100,000 times since the bridge was built.

The Season in Full Swing at Ottawa

Activity in Municipal and General Constructional Circles—Federal District Scheme Presented to Council—Bridge and Paving Work

Correspondence of The Contract Record

Construction work is now in full swing in Ottawa. During the past week ground was broken for several large structures among them being the new Journal Building $110,000, new Ladies College $130,000, and a new business block for Blackburn Bros. $150,000.

New Journal Building

This building, which is being erected on Queen street, about one hundred feet west of Bank street for the proprietors of the Ottawa Evening Journal will be eight-storeys in height and will cost about $110,000. It has a frontage of 56 feet and a depth of 90 feet. From the sidewalk to the parapet it will be 95 feet. Every facility is provided for an absolutely fireproof building throughout. The construction is of reinforced concrete, faced with Astrakhan ornamental brick, with Indiana stone trimmings for cornice and around centre windows, the spandrils being formed of metal. The base of the front of the building is stone to the main floor windows. The entrance to the main floor, which will contain the business offices of the Journal, will be finished with marble, with glass screens between corridor and offices. The floor will be of Terrazo, and the ceiling of plaster cornice. Terra cotta partitions will be used. Separate passenger and freight elevator services will provide rapid communication with all parts of the new building. Ample lighting and ventilating facilities have received careful consideration in the planning of the building. Light is provided on both sides from ten-foot right-of-ways, with an eighteen-foot light area in the rear. Mr. Arthur L. Weeks, 75 Sparks street, Ottawa, is the architect, and Messrs. Shuttleworth and Black are the general contractors.

Centering for main arch, Bank Street Bridge, Ottawa

Bryson Realty Company's Building

Mr. A. L. Weeks is at present preparing plans and specifications for the above company's building to be erected on Queen street between Bank and O'Connor streets. It will be five-storeys in height and constructed of fireproof material throughout. The estimated cost of the building is $105,000.

Blackburn Bros. Building

Work was commenced last week in the tearing down of old buildings which were recently damaged by fire at the corner of Rideau and Sussex streets. Messrs Blackburn Bros. are having plans prepared by Mr. W. E. Noffke, of the Central Chambers, for the erection on this site of an eight-storey structure costing in the neighborhood of $150,000, to be used for stores and offices. It will be constructed of steel and stone.

Mr. J. Albert Ewart is preparing plans for the Booth Building. It will be erected on Rideau street opposite the new Blackburn block, and will be seven-storeys in height, constructed of reinforced concrete. The cost of this building will be about $120,000.

Federal District Scheme

At the last meeting of the City Council Mr. Noulan Cauchon presented his plans for the above scheme. According to the plan all the railways, now and hereafter entering from the east, should be concentrated at a point about two and a-half miles east of the Rideau River, and from thence into and through the city via the eastern and western banks of the Rideau Canal. This entails the tunnel proposition, and the further concentration on one right-of-way along the Ottawa River front to a point beyond Britannia. The scheme provides for the existing right-of-way to be converted into a much needed artery boulevard. An important part of the scheme includes the abandoning of the Rideau Canal and utilizing the bed of same for a driveway to connect up the great cross town boulevards and other driveways with the Ottawa River front park driveway. Mr. Cauchon also proposes a bridge running from the King's Way to the Chaudiere and to Hull.

Bank Street high level bridge, Ottawa

The Ottawa Electric Railway Company will commence the extension of their system to Ottawa South immediately the Bank street High Level Bridge is completed, which should be in about fourteen days. Their tracks will run over the bridge to Sunnyside avenue, along that street to Seneca, then into Bank street again via Grove street.

The Railway Company will double track Crichton street this year from St. Patrick street to Sussex street. The city will require to widen this street at once to allow for the double tracking.

Billings Bridge, Bank Street

During the spring floods on the Rideau River the old wooden structure known as Billings Bridge was almost washed away,—being damaged to such an extent that it is unsafe for heavy vehicular traffic. Plans have been completed by the City Engineer's Department for a new reinforced concrete bridge and the construction work will be commenced whenever an agreement is drawn up between the Gloucester Road authorities and the city regarding the proportions of the cost to be borne by each.

Permanent Pavements

Construction work will be commenced this week on several asphalt pavements. The Union Construction Company will pave Arlington avenue and Nelson street, and the Ottawa Construction Company will commence work on Powell avenue and Charlotte street. Experiments will be made this year with Tarvia X and "Rocmac."

About $20,000 is at present being spent in converting the old graveyard in the Sandyhill District into a park. Mr. Alex. Stuart, Engineer for the Ottawa Improvement Commission, is in charge of the work.

Tenders are at present called for the sinking of three or four deep wells for the purpose of obtaining a supply of pure water. $15,000 is to be spent on this scheme. Acting Waterworks Engineer Storrie is in charge.—L. McL. H.

Five Millions in Building at Winnipeg

Correspondence of The Contract Record

Winnipeg, May 1st, 1913.

WITH continuous fine warm weather for the past fortnight the building situation has opened up considerably. The year's total of permits is now nearing the five-million-dollar mark and the daily records show good increases. On the 28th ult. forty-one permits were issued for an aggregate amount of $477,000. The large item of this was for the Isaac Brock school, which is to be erected on the block bounded by Clifton and Spruce streets and Barrett and Molever avenues at a cost of $240,000. The school will be a two-storey building 190 ft. by 150 ft.

The greater amount of the permits continues to be issued for dwelling houses. The West End Realty and Building Company took out permits on the above date for twenty houses for a total amount of $106,000. The most expensive of these is one to be built on Yale avenue at a cost of $16,000. The remainder are to cost from four to five thousand dollars each.

Work is proceeding at a good rate on the Great West Permanent Building, which is the largest at present under construction in the central business district. The steel work is now up to the full height.

One of Winnipeg's most expensive residences is that of Mr. A. E. [illegible] The building is now nearing completion and will cost approximately $150,000. It is built of cut limestone, imported from Amherst, U.S.A. The erection was done by the Imperial Construction Company of Toronto. At the rear of the house is a commodius garage which is built of the same stone as the house.

Another very fine residence nearing completion is situated on Wellington Crescent, about one hundred yards west of the Meryland Bridge. This house is built of Tyndall stone.

The "Million for Manitoba League" have leased the property east of the Industrial Building and are putting up a market building to be used as an experimental produce market. This building will cost $10,000 and will be replaced by a larger one if the scheme proves a success. Mr. P. C. Samuel is the architect. The contract calls for the market to be ready for occupation by June 1st.

Announcement has been made that the Quebec Bank will proceed at once with the erection of a handsome four-storey building on Portage avenue, between Main and Fort streets, on the site of the building at present occupied by the Street Railway Company's offices. This new bank building will be an ornament to this portion of the avenue and will have an imposing front constructed entirely of granite. Messrs. Brown & Vallance, of Montreal and Winnipeg, are the architects.

The Canadian Pacific Railway Company have awarded the contract to the Westinghouse, Church, Kerr Company, of New York, for extensive alterations to their depot and to the Royal Alexandra Hotel. The contract amounts to over one million dollars. Work is to be started in the immediate future and includes what will practically mean doubling the capacity of both the hotel and the station. The portion of the station immediately east of the hotel, which was previously occupied by the Express Company, will be removed and the addition to the hotel erected on this site. This addition will be ten-storeys in height and will contain three hundred bedrooms.

It is planned to bring the front of the station out so as to be in line with that of the hotel. There will be extensive changes in the trackage and all the tracks will be raised some eight feet. Entrance to them will be made through subways instead of the present level platform.

The city authorities have called for tenders for two sample test towers for a 110,000 volt transmission line. If these towers prove satisfactory under test, a contract will be let immediately for the construction of a transmission line of 75 miles from Winnipeg to Point du Bois. This line will be constructed on the right-of-way owned by the city which has on it the 60,000 volt line now in use. It is planned to have this line in operation by the fall of 1914.

The city will also shortly call for tenders for an extension to the Electric Terminal Station, which will cost in the neighborhood of $60,000.

A Masonic Temple, which will cost $250,000, independent of the site, will be erected at Toronto. Architects will be invited to submit competitive plans for the new building, which will be one of the finest of this nature in the Dominion. When completed, the proposed structure will be the home of twenty Masonic bodies. The land, which has already been secured by the directors, has a frontage of 100 feet with a depth of 198 feet.

A new feature in industrial buildings is being introduced in Toronto in the new Copp, Clark Company's building, which is to be erected in Toronto. This building, the plans for which are now nearing completion will be of one-storey. This class of industrial building is being widely adopted in the United States. Employers have come to the conclusion that, although these structures take up a great deal more land, much time is saved in having the employes all working on the same floor, thus doing away with the necessity of having elevators, and saving the time lost by employees having to go up and down stairs to reach the various departments. The development of this style of building is resulting in industries being located more in the outskirts of the cities, where the land is comparatively cheap.

From the Saskatchewan Capital

Correspondence of The Contract Record

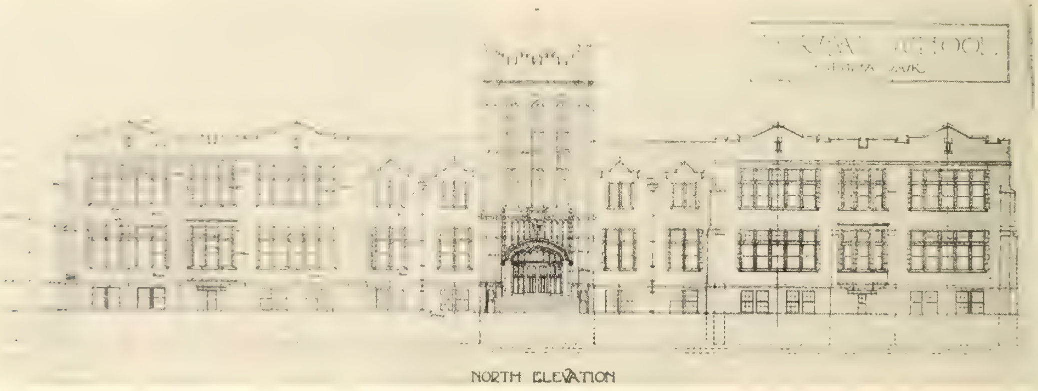
BUILDING operations are in full swing at Regina. The steel work has been completed on the 10-storey McCallum Hill Building, a view of which was shown in our issue of April 23rd. An announcement of interest is that the G. T. P. plan the erection of a 9-storey hotel here at a cost of $1,000,000 and a 5-storey station. The total cost will be over $2,000,000. The city council are contemplating the erection of a new City Hall, estimated to cost $300,000.

According to Mr. A. J. McPherson, Chief Highway Commissioner of the province, figures are now being obtained in connection with a scheme to link Regina to Moose Jaw by means of a paved road.

Excavation has commenced at the site of the proposed Normal School, elevations of which are reproduced herewith.

It is reported that a new theatre will be erected in Regina within the near future, W. B. Sherman, of Calgary, was in the city recently and it is stated on good authority that Mr. Sherman's visit was with a view to securing a site for a theatre.

The Dominion Government has decided to dredge the Qu'Appelle River where it links up with the Fishing Lakes in the vicinity of Fort Qu'Appelle, and to construct three dams, which will considerably increase transportation facilities.



Proposed Normal School, Regina.—Estimated cost, $250,000.

Construction work on the street railway extensions has already been started. At the present time there are about 100 men at work but in the course of the next month and a-half it is expected that there will be at least 400 employed. Altogether $825,000 will be expended by the city on street railway work.

The contract for the erection of the Wetmore Public School in Broders Annex has been let to Wilson & Wilson, their tender being $166,870. Seven firms tendered on the work, the highest figure being $183,220.

Further details of the plans of R. M. Hillman have been learned. On the site secured by Mr. Hillman he proposes to erect a hotel building which will cost well over $300,000. It will contain 150 rooms and will be 50 feet by 125 feet. Plans for the building were drawn by Mr. O'Leary, the architect of the provincial university at Saskatoon.

Regina is to have a sterilization plant. Work on it will commence early and an up-to-date system will be installed. The engineers having the matter in hand are studying the systems used in the larger cities and will recommend only the best system. It is the intention of the city to instal a softening plant also, but that will not be done during the present year.

Canadian Railroad Development

Sir Thomas Shaughnessy, President of the Canadian Pacific Railway Company, recently stated that his company would spend over $100,000,000 in the near future in double-tracking, constructing branch lines, etc. This amount is exclusive of that for rolling stock.

The Canadian Northern Railway has started final surveys for the proposed tunnel by which it will carry its line from the North Arm of the Fraser to the terminals at False Creek, New Westminster, B.C. This will be a double track, concrete lined tunnel, 4½ miles long, and will cost about $3,400,000.

The Canadian Pacific Railway is erecting a new freight shed at Fort William with a capacity of 100,000 tons, owing to the increased volume of the business of the company. The new shed will be used for coal purposes and the coal will be loaded by means of an overhead gallery and a system of tunnels, which is a departure from anything the company has used before. It will provide employment for two hundred men.

The Canadian Northern Railway will construct a new line between a junction near the Deer Lake Station, on the Toronto to Sudbury Road, and Callender, in Northern Ontario. With the completion of the proposed line a new through route will be linked up from Toronto to North Bay.

Mr. T. Daly, Montreal, has been awarded the contract for completing the Levis-New Brunswick section of the National Transcontinental Railway. This stretch of road is 190 miles long, and there is still considerable track laying to be done besides some bridging and ballasting. The contract calls for completion of the section before September 30th.

Application has been made to the Board of Railway Commissioners by the Canadian Northern Railway and the Canadian Northern Branch Lines Company for the sanction of an agreement amalgamating the two corporations. By this decision the road will come under one management, which will be controlled from the head office of the Mackenzie & Mann Company in Toronto and capital valued at over $200,000,000 will be represented in a single corporation.

In connection with the addition to the Windsor street, Montreal, station of the C. P. R., it is proposed to re-model the front of the old building on Osborne street. There will be new office entrance for the employees fed by two express elevators behind which there will be a third specially constructed elevator for freight purposes. Running along Osborne street from the new entrance there will be a series of six entrances into the station, which will open into a vestibule, at the west end of which will be situated the baggage room, transfer offices and the United States Customs. The construction of new train sheds is proceeding, the Dominion Bridge Company having the steel work in hand, while the Geo. A. Fuller Company, Limited, will do the rest of the work. The sheds will be much longer than those which are now being demolished.

Mainly Constructional

The News in Brief—From Coast to Coast

It is estimated that over $20,000,000 will be spent this year at Fort William for harbour improvements.

More than $4,000,000 will be expended in Porth Arthur this year in new buildings and local improvements.

Work will shortly be started on the $500,000 factory which is to be started at Fort William for the Maritime Nail Company.

The ratepayers of Brandon, Man., will shortly be asked to vote on a by-law to allow the expenditure of $200,000 on a waterworks system.

The Ely Brick Company has recently been organized at Dryden, Ont. Several acres have been acquired and red brick will be manufactured.

Building permits for the first four months of the year at Toronto amounted to $8,632,405, an increase of $2,000,000 over the corresponding period of 1912.

Building permits for the first three months of the year for Swift Current, Sask., amount to $466,820, against $15,360 compared with the same period in 1912.

Good progress is being made with the work on St. Augustine's Seminary at Toronto and it is hoped that the building will be ready for occupancy by August next.

The people of Medicine Hat will vote on twelve by-laws on May 15th. The by-laws will cover an expected expenditure in municipal improvements of $932,000.

The Montreal Council have decided to purchase land on the Back River for the purpose of erecting a plant for treating sewage before it empties into the river.

The details will shortly be arranged by Dr. Galbraith, Dean of the Faculty, and announcement of the plans will be made by the Registrar, Mr. A. T. Laing, in due course.

The Montreal Controllers have decided to increase the salaries of the engineering staff. In future $1,000 per annum will be the lowest salary paid to a junior engineer.

The 11th annual dinner of the Engineers' Club of Toronto will be held on Thursday, April 24th. Mr. Chas. H. Heys is Chairman of the House Committee, and Mr. R. B.

It is expected that the Dominion Government will take over the property for the Post Office extension site, Toronto, in a few months. Notices of expropriation have already been sent out.

A deputation from the counties of Chateaugay, Beauharnois and Huntingdon, P.Q., have asked the Hon. J. E. Caron, Minister of Agriculture, for aid in constructing a new highway between Montreal and New York. The new highway, it is suggested, should run from Caughnawaga to the frontier, either at Fort Covington, or a nearby point. It would pass through the parishes of Chateaugay, St. Philomene, Ste. Martine, Howick, Ormstown, etc., following the general line between Montreal and New York via Malone.

The Maritime Coal, Railway & Power Company, Limited, contemplate carrying out during the present year large extensions to the power plant at Chignecto and the electrification of the colliery plant at Joggins Mines.

Mr. J. F. Ryan, Fredericton, has been awarded the contract for the new Agricultural School and the new Memorial Library to be erected at Woodstock, N.B. The cost of the buildings will be $40,000 and $30,000 respectively.

Messrs. A. Robinson and Company, Newcastle-on-Tyne, Eng., will erect a brick-making factory at Tofield, Alta. Machinery for the plant has already been ordered from Toronto and will be installed as soon as it arrives at Tofield.

The new Knox Church, Saskatoon, which is nearing completion, is one of the most beautiful churches in the city. The style of architecture is modern Gothic, and the building covers a site 132 by 100 feet. The total cost will be $140,000.

From information published at the Department of Railways and Canals at Ottawa recently, it appears that, if present plans carry, tenders for the new Welland canal will be called for during this month. What is known as the Ten-Mile Creek route has been finally adopted.

The Board of Control, Montreal, have appointed two of the supervising engineers who are to have charge of the public works of the city. Mr. Auclair is to be the engineer for the north end, and Mr. Cadieux engineer for the eastern division. The salaries will be $2,500 each.

According to a Quebec correspondent, Messrs. M. P. & J. T. Davies, who have the contract for building the transcontinental railway terminals in that city, have received orders to proceed at once with the work and to make every effort to complete it by the Fall.

At a recent meeting of the Vancouver Chapter of the B. C. Society of Architects Mr. H. H. Martyn, of Cheetenham, England, delivered an interesting lecture on "Wood Carving," illustrated by portforlios of illustrations of the best specimens from the Old Country and Europe.

The Provincial Department of Public Works is inviting tenders, receivable up to May 7, for the complete structure of a concrete arch across the North Thompson River at Lytton, B.C., also a steel bridge to be erected alongside the present structure and superstructure metal for same.

Good progress is being made on the building of the Quebec Bridge. The contractors have about three hundred men levelling the approaches at both sides of the river, and a number of masons and stone cutters are working at the piers to have everything in readiness for the superstructure, the erection of which will be commenced shortly.

The Montreal Board of Control have recommended that the council purchase the Montreal Water & Power Company's property in St. Henri Ward, the idea being to acquire the undertaking ward by ward. The President of the company states that they will vigorously oppose this plan; they are however, willing to sell the entire undertaking by arbitration.

At the request of many contractors, the Montreal Council have changed the system of guarantee by firms who receive civic work. Hitherto large sums have been deposited with the City, who either used the money or left it with bankers, receiving interest thereon. This naturally tied up a large amount of capital. By the new system contractors will deposit marked cheques, which the city will retain until the contracts are finished, but the money will remain in the hands of the contractors' bankers, and the firms will thus be able to receive interest on their guarantees, instead of it going to the city.

Plans have been accepted for the Northern Club, Edmon ton, and work will be started immediately. The building, which will be a seven-storey one, will be erected by the Kahn reinforced construction system, and will be used entirely as club premises. The dimensions of the building are 50 feet by 150. The total cost of the building, irrespective of furnishings, is estimated at $250,000.

A supplementary programme of improvements for the current year has been adopted by the Montreal Harbor Commissioners. This includes the extension of two piers by 250 feet to enable the berthing of the largest vessels visiting the port; the raising of the track between the dry dock and the Racine Pier at Longue Pointe; the extension of Victoria Pier, and the expenditure of $100,000 on a new quay wall at Mackay Pier.

Four firms tendered for the construction of the first section of the proposed underground conduits in Montreal—the Hickey Contracting Company, G. M. Gest, the Standard Construction Company, and Quinlan & Robertson. The work is to construct conduits along St. Catherine Street, in which the present overhead wires are to be placed. The Board of Control awarded the contract to Mr. G. M. Gest, the estimated cost being $271,000.

Road-building is to be taught in the University of Toronto in the near future. Because of the rapid spread of the good roads movement in Ontario the Faculty of Applied Science contemplates including in next year's curriculum, provisions for lectures on the construction of various types of roads suited to the Canadian climate. The details will shortly be arranged by Dr. Galbraith, Dean of the Faculty, and announcement of the plans will be made by the Registrar, Mr. A. T. Laing, in due course.

The Regina Builders' Exchange recently held their annual meeting and elected officers for the ensuing year. Included among the new officials are some prominent men and hard workers, so that the exchange may be assured of good results during the year. J. M. Taylor, of the Northwestern Electric Company, was elected president. The other officers appointed are as follows: Vice-president, D. Smith; secretary, William Whiteford; executive committee—H. Potts, George Minkley, A. Young and W. A. Wilson.

The new Customs House for Toronto is to be built immediately adjoining the present building. The new structure will cover the whole distance between Yonge and Bay streets on the south side of Front street, and will reach back —southerly—a distance of 135 feet. Special arrangements will be made to facilitate the examination of baggage and special connections will be made with the new Union Station and the boats. It is understood that the cost of the new building, including the cost of the land, will be approximately $2,000,000.

The waterproofing on the new high school at Montreal (Messrs. E. & W. S. Maxwell, architects) is being executed under the direction of the Industrial Foundation and Waterproofing Company, Toronto. The system employed embraces the "integral" method, with the use of Hydratite in the form of plaster coatings on all interior walls and floors. This is one of the largest jobs of the kind being executed under the particular method in Canada today. The caissons for this construction are sunk forty feet to bed rock, the installation being done under the Wakefield Method.

Unexpected difficulties have been met in sinking the piers in connection with the foundation of the new Customs warehouse, at the corner of Youville Square and McGill street, Montreal, the general contractors for which are the Peter Lyall Construction Company, Limited. These difficulties have resulted in a contract being awarded to the Foundation Company, Limited, Montreal, for sinking the piers by the pneumatic process to rock. The same company were responsible for the foundations of the Dominion Express Building and the addition to the Windsor Station of the C. P. R., the former being also a pneumatic caisson job.

Personal Mention

Mr. J. D. Evans, Montreal, was elected a member of the American Society of Civil Engineers at a recent meeting of that body.

Mr. W. H. R. Nimmo, Vancouver, B.C., has been elected to associate membership in the American Society of Civil Engineers.

Mr. J. E. Askwith, formerly assistant city engineer of Prince Albert, was recently appointed town engineer of Redcliffe, Alta.

Mr. J. Antonisen, city engineer of Moose Jaw, has been appointed superintendent of the Brandon Municipal Street Railway System.

Sir Robert Perks, Bart., the eminent English engineer, was recently in Toronto in connection with the planning of the Georgian Bay Canal route.

Mr. G. B. Wilson, who has been for many years Secretary to the Mayors of Toronto, was recently appointed Street Commissioner of that city at a salary of $3,500.

Mr. J. B. Chenevert, for eight years superintendent of the Montreal civic incineration department, died at his home last week after an illness of two days' duration.

Mr. Alexander Gray, Assistant Engineer, Public Works Department, Ottawa, has been notified of his election to membership in the American Society of Civil Engineers.

Mr. A. D. Shibley, who retired lately from the position of City Clerk of Westmount, was recently presented with a gold watch and chain by the council and civic staff.

Mr. C. T. Delamere, Assistant District Engineer, Canadian Northern Railway, Port Arthur, Ont., has been elected an Associate Member of the American Society of Civil Engineers.

Mr. W. F. Farley, Assistant Engineer, Ambursen Hydraulic Construction Company of Canada, Limited, has been elected an Associate Member of the American Society of Civil Engineers.

Messrs Carrere & Hastings and Eustace G. Bird, associated architects, have removed from the Traders Bank Building, Toronto, to the new Bank of Toronto Building at the corner of King and Bay streets.

Mr. W. P. Gillespie is president, Mr. H. C. French, vice-president, and Mr. Chas. G. Gillespie, managing director, of the newly incorporated Canadian Contracting & Construction Company, Limited, whose offices are in the McKinnon Building, Toronto.

Mr. Harry Alexander, electrical, mechanical and contracting engineer, New York, Boston and Toronto, has removed his Toronto office from the Traders Bank to the new Bank of Toronto Building. Mr. J. M. Lindsay is local manager for Mr. Alexander.

Mr. E. H. McHenry, vice-president in charge of engineering, construction and maintenance of the New York, New Haven and Hartford Railroad, who has just resigned after fulfilling the duties of this office since 1909, was chief engineer of the Canadian Pacific Railway for two years prior to his last appointment.

Waterproofing and Coloring Compounds

By March G. Bennett

THE coloring of concrete, which has been a very perplexing problem, is, like the other uncertainties that have attached to concrete construction, gradually becoming simplified and certain. At the same time, the demand for artistic and satisfactory exterior color treatment has become very general, owing both to the uncertainties of tone produced by the natural concrete and its variation, and to the cold and cheerless monotony that prevails where a large number of concrete buildings are grouped together.

The experimenters in the concrete coloring fields have groped and tested for years, with many failures and few successes, but the failures have been almost as educational as the successes, and the natural result is a much more definite and clear idea of the requirements than ever before. Probably the first attempts at coloring were made by mixing ordinary mortar colors into the concrete or plaster. Occasionally this was successful, but in the vast majority of cases the coloring was patchy and uneven, and off shade. It is almost impossible to make a good even tone by such mixing. Another fundamental objection to this method of coloring is that it certainly weakens the bond to a greater or less degree, and engineers and architects are agreed that even the slightest weakening by such a mixture is objectionable. The next method was by the use of ordinary paint, but the alkali in the cement promptly put an end to this, because the almost universal result was destruction of both the color and the fixative, causing the compound to fade, chalk and peel off. Then came the special castings, compounds that avoid the weaknesses of paint, but which are essentially painty in their character and form a thick coating over the surface of the cement, entirely covering it up, and substituting the coloring material for the cement surface.

John D. Speckles' residence, Coronado, Calif. Harrison Albright, Architect, Los Angeles.

In cases where color only is desired, and texture is of no consequence, these coatings have proved quite satisfactory, but for those who desire to preserve the natural texture, and at the same time to get an artistic coloring effect, such a material will not be satisfactory. The problem is precisely the same as that of woodwork, so far as artistic value of the results is concerned, and those who prefer the smooth, even surface of a heavy paint will find the cement paints or coatings satisfactory, while those who prefer the transparency and depth and softness of the stain effect will not be pleased with anything that is opaque and painty.

Therefore, it is this large and increasing group of cement users that the cement stains have been designed to please. The stains are transparent and color the surface of the concrete without covering it with a thick coating like paint. They sink into the pores and preserve the natural texture of the cement almost as completely as though nothing had been applied, while at the same time coloring it in rich, deep tones that are infinitely more artistic in their character than any opaque coating can be. Many other adadvantages are claimed for stains as compared with all other coloring agents for cement work. Prominently among them are the ease and rapidity with which they can be applied. Any intelligent workman can apply them, using a broad flat brush, and doing the work more than twice as quickly as a heavy painty material can be put on. Then, they cover from twice to three times as much surface per gallon as the heavy paints, and their original cost is very much less. This makes the job more economical in every item, but in addition to this, it is maintained that the wearing qualities of the stains are much more satisfactory than those of any other coloring agents. The fact that they do not form any skin or coating over the surface makes it impossible for them to crack or peel off. They, therefore, grow gradually softer with age, and the result of this is so agreeable that many users are contented to let them stand for many years without renewing. "Growing old gracefully," is one of the phrases used in setting forth the merits of these compounds.

Residence, W. Seattle, Wash. Wilson & Loveness, Architects, Seattle.

But, in addition to these coloring advantages, the stains waterproof the surface completely and permanently. The vehicle contains an indestructible waterproof compound, which enters and seals the pores of the concrete, and as it does not oxidize by age, this waterproofing effect lasts for all time. In this respect, of course, the stains have an argument that cannot be used in favor of the coatings, none of which claim to be really waterproof. The waterproofing ingredient used in the stains has been tested upon actual work of various kinds for more than twenty years, and has thoroughly demonstrated both its efficiency and its permanence.

Brocklesby & Smith, Architects, Hartford, Ct.

It would seem, therefore, that the opening remark about the solution of the coloring problem for concrete is amply justified, and what with these waterproof stains, and such of the coatings as have proved successful by trial, the pathway of good coloring should be clear for the future

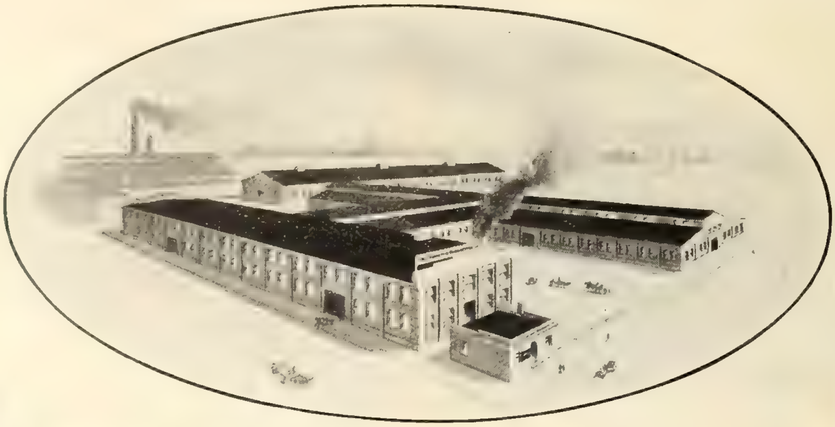
Concrete Machinery in Canada

THE manufacture of concrete machinery is practically a new industry in Canada. Ten years ago no machines of this type were made here; all were imported. To-day the contractor can buy almost any machine for the working and handling of concrete, right at home, thus saving the freight and the 27½ per cent. duty payable on imported machines. The contractor has been quick to take advantage of the home market with the result that Canadian manufacturers in this line have made enormous progress, there have been little appreciable competition from outside sources for the reason that machinery can be manufactured as cheaply in Canada as in other countries. The best skilled labor is available at moderate wages and our factories are equipped with automatic machinery and labor-saving devices of the best type.

These observations serve to introduce a few remarks concerning a firm that claims to be the largest manufacturer of concrete machinery in the world. We refer to The London Concrete Machinery Company, Limited, whose twelve-page advertisement in our Annual Number of April 30th was so eloquent as to the class and variety of the company's product. This firm is too well-known in Canada to need any formal introduction or any statement regarding the extent of their home business, but it may not be generally known that within the last year they have sent carload lots of machinery to New Zealand, Australia, South America, India, England and other countries. They expect a great increase in their foreign shipments this year, at the same time doubling their home trade in conformity with previous records.

It is of interest to recall the fact that this firm started to manufacture concrete machinery only eight years ago. The promoters were Mr. H. Pocock, and Mr. J. C. Doidge, now the principal directors. From a small beginning these gentlemen built up a trade of international dimensions—a high tribute to the value of Canadian brains and Canadian capital.

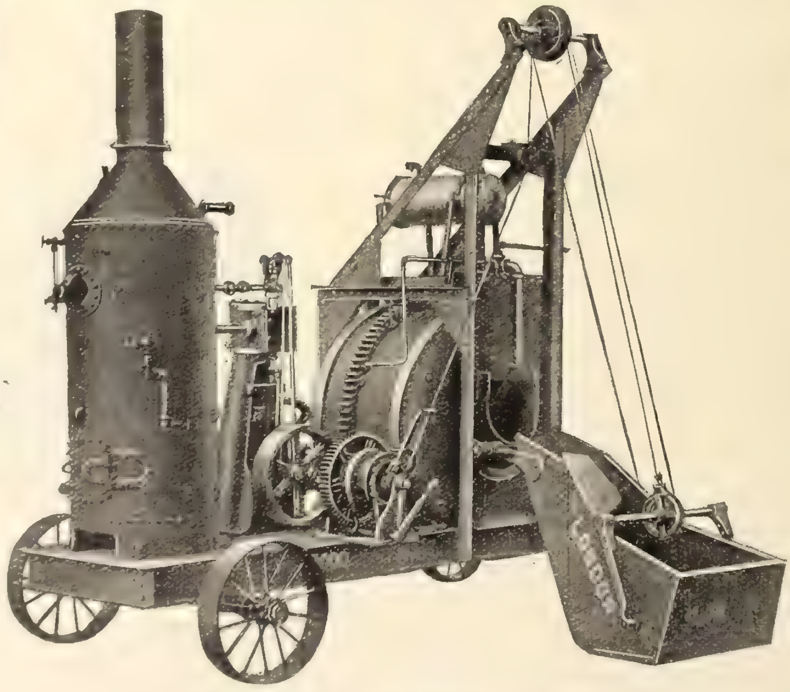
Mr. Pocock was formerly a prominent contractor and has had large experience in the architectural field, while Mr. Doidge has had an extended connection with the manufacture of high-grade machinery.



Plant of the London Concrete Machinery Co., Limited, at London, Ont.

Mr. H. Pocock, president, London Concrete Machinery Company, Limited.

Mr. J.C. Doidge, vice-pres't. London Concrete Machinery Company, Limited.



The London standard drum batch mixer.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Alvinston, Ont.
Council contemplates making extensive improvements and extending present sewerage system. Town Clerk, John Irving.

Chatham, Ont.
City Council contemplates laying several new sewers and repairing old ones. Mayor, A. J. Dunn. Clerk, W. G. Merritt.

Fort William, Ont.
Waterworks tunnels. Clerk, A. McNaughton. City engineer, Ray R. Knight. Tenders received by clerk till noon, May 29th for construction of 3 tunnels in Hudson Shale, etc., with reinforced concrete lined shafts, viz., tunnel under Kaministikwia River, length 1,275 ft., width 7 ft., height 8 ft., depth 119 ft., under Mission River, length 677 ft., width 5 ft., height 6 ft., depth 95 ft., under McKellar River, length 629 ft., width 5 ft., height 6 ft., depth 91 ft. Plans, etc., at office of Consulting Engineer, T. Aird Murray, 303 Lumsden Building, Toronto.

Lachine, Que.
Tenders received until May 13th for supply of materials required for installation of electric light in certain sections, construction of drainage and waterworks. Plans, etc., from V. H. Dupont, 225 St. James street, Montreal, and Hector Charette, City Clerk, Lachine, to whom tenders must be addressed.

London, Ont.
Pavement, cost $20,000, planned by C. P. R. Engineer, W. Tapley. Approaches for 2 blocks each way and all around big freight sheds will be paved with granite-brick.

Middleton, N.S.
Sewerage extension, cost $6,000, planned by Town Council. Clerk, J. A. Gates. Chairman Sewerage Com., T. E. Bentley. By-law passed by ratepayers.

Niagara Falls, Ont.
Sewer, cost $75,000, contemplated by the city council. Clerk, W. J. Seymour. City engineer, F. J. Anderson. 4,000 ft. 72 in. concrete sewer, Muddy-run Creek bed, very little excavating. Tenders will be called.

Port Arthur, Ont.
Tenders received by Commissioner up to May 19th, 3 motor-driven centrifugal pumps, 2,000 gals. capacity each per minute, with valves, meters, switchboard and all necessary apparatus for operating same. Plans, specifications, etc., at office of City Engineer, Consulting Engineer Toronto and Winnipeg, and MacLean Daily Reports, Toronto. Commissioner of Utilities, J. J. Hackney. City engineer, L. M. Jones. Consulting engineer, T. Aird Murray, 303 Lumsden Building, Toronto.

St. Thomas, Ont.
Tenders received by Chairman of Commissioners, Geo. K. Crocker, until May 15th, 1913, for (a) excavation and backfilling for laying 16,000 ft. water mains; (b) laying mains and pouring the joints. Specifications at office of Engineer, M. Ferguson, and MacLean Daily Reports, Toronto. Sec.-Treas. Commissioners, S. O. Perry.

Saskatoon, Sask.
Tenders received until May 20th by Sec.-Treas., H. H. Elliot, M.D., for "C" for supply and delivery of 4,400 ft. 12 in. steel pipe or cast iron pipe, 3,500 ft. of 10 in. steel pipe or cast iron pipe, 4,400 ft. of 8 in. steel pipe or cast iron pipe, 2,000 ft. of 6 in. steel pipe or cast iron pipe, 50 specials, "D" supply and delivery of 30 hydrants, 52 gate valves and boxes, "E" supply and delivery of 2 pneumatic storage tanks. Plans, specifications, etc., at offices of Consulting Engineers, Murphy & Underwood, Montreal, Toronto and Winnipeg.

Simcoe, Ont.
Sewerage system planned by town council. Mayor, L. C. Gibson. Engineers, Chipman & Power, Mail Building, Toronto. Tenders received by Clerk, W. C. McCall, until May 10th. Contract "P" sewage pumping station; Contract "X" sewage disposal works. Plans, etc., at office of Engineers, Toronto and at Town Hall, Simcoe.

Tilbury, Ont.
Extension waterworks system contemplated by the town council. Town Clerk, W. A. Hutton.

Toronto, Ont.
Tenders received by Mayor, H. C. Hocken, Chairman Board of Control, until May 13th for construction of pavements, concrete walks, curbings and sewers on a number of city streets. Specifications, etc., at office of Commissioner of Works, City Hall.

Sewers in Parliament, Berkeley and King streets. Specifications, etc., at office of Main Drainage Section Dept. of Works. Tenders received by Chairman until May 13th. Mayor, H. C. Hocken.

The Works Committee contemplate grading Bathurst St. Hill and building concrete retaining walls. Mayor, H. C. Hocken.

Windsor Mills, Que.
Macadamizing roads. Municipal council are negotiating for loan of [illegible] from Provincial Government under the Good Roads Act. Address, M. Meagher.

Waterloo, Ont.
Water mains planned by Town Council. Engineer, Chas. Moogk. 5,000 ft. cast iron pipe and fittings, 15 hydrants required, to be installed by Water and light Comm.

CONTRACTS AWARDED

St. John, N.B.
Water and sewerage system. In Adelaid street $4.50 per lin. ft. in rock and 92 cents per lin. ft. in earth. Douglas avenue $4.23 per lin. ft. in rock and 93 cents per lin. ft. in earth. Commissioner, R. W. Wigmore. General contractor, Fred Nice, 20 King street west.

Railroads, Bridges and Wharves

Angus, Ont.
Tenders received by Frank Barber, Con. Engr., 57 Adelaide east, Toronto, for concrete abutments and concrete bridge floor, or concrete piers and concrete shore spans and bridge floor, bridge over Nottawasaga River, between Twps. of Essa and Sunnidale. Plans, ets., at office of Engineer.

Armstrong, B.C.
C. P. Rly. Co. has been authorized to construct spur for Kelawna Farmers' Exchange, Limited.

Fernie, B.C.
C. P. Rly. Co. has been authorized to construct spur for Fernie Fort Steele Brewing Company, Limited.

Galt, Ont.
Freight sheds, cost $12,000, for C. P. R. Engineer, W. Tapley, London. One sty. white brick construction. Plans in progress.

Hamilton, Ont.
Underground conduits planned by City Council (Hydro Elec. Dept.). Mayor, John Allan. Clerk, S. H. Kent. Engineer in charge, E. J. Sifton. Tenders received by electrical department for 700,000 ft. of underground conduits.

Hinton, Alta.
G. T. P. Rly Co.'s location of station at Hinton, mileage 977.4 west of Winnipeg in Sec. 15-51-25 W-5-M Alta. has been approved.

Ingersoll, Ont.
Freight shed, cost $15,000, for C.P.R. 145 x 55, cement foundation, brick construction, cement approaches to building. Plans prepared.

Kandahar, Sask.
C. P. Rly. Co.'s location of station on N.W. ¼ Sec. 21-32-17 W-2-M at Kandahar has been approved

Kleinburg, Ont. (York Co.)
Tenders will be received by Engineer R. W. Phillips, 57 Adelaide east, Toronto, Board of Highway Commissioners, York Co., until noon, May 12th, for reinforced concrete bridge over Humber River, Lot 23, Con. 8, Vaughan, near Kleinburg, Ont.

Plans at office of Engineer, Frank Barber, 63 Adelaide east, Toronto, or with T. A. James, chief engineer.

Swift Current, Sask.

Canadian Pacific Railway Company has been authorized to construct spur for Massey-Harris Co., Ltd.

Canadian Pacific Railway Company has been authorized to construct Swift Current nothewesterly branch from mileage 0 to mileage 227.05

Toronto, Ont.

Sewers, Glen and Elmer avenues, Kenilworth Creek Storm Sewer No. 2 and two lanes. Plans at office of Commissioner of Works. Mayor, H. C. Hocken. Tenders received until May 13.

Twp. of North Grimsby, Ont.

Tenders received by Clerk, T. W. Allan, Winona, Ont., for bridge 36 ft. x 16 ft., stone and cement substructure, steel with cement floor.

CONTRACTS AWARDED

Metcalfe Twp., Ont.

Four bridges, cost $4,500. Clerk, Richard Ward, Strathroy. General contractors, R. Waltham and W. Inch, c/o Clerk. Steel and concrete.

Moorefield, Ont.

Reinforced concrete arch bridge for Twp. of Maryboro. Clerk, R. MacArthur. Engineers, Bowman & Connor, 36 Toronto street, Tornoto. General contractor, E. Simmons, Drayton, Ont. 80 ft. arch, 16 ft. roadway.

Ottawa, Ont.

Machinery and dredges, cost $13,500, for Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, F. H. Hopkins & Co., Imperial Bank Bldg., Montreal., to be used on the Hudson Bay Terminal.

Peterboro, Ont.

Freight shed, cost $15,625, Charlotte street, will be erected by C. P. R. Co. 410 x 50, frame construction. Permit issued.

Toronto, Ont.

Widening bridges, cost $50,000, between Islington and Woodstock in connection with the double tracking of the C. P. R. line. Engineer, W. Tapley, London. Contract awarded to Jones & Girouard, Room 26, Central Chambers, Ottawa.

Willow Point, B.C.

Wharf, cost $7,250, planned by Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, Wm. English, Kaslo, B.C.

Public Buildings, Churches, Schools, etc.

Beauport, Que.

Tenders received by Col. Eugene Fiset Deputy Minister Militia and Defence, Ottawa, until May 16th for construction of new drill hall. Specifications, etc., at offices of Officer Commanding 5th Division Quebec, P.Q., Town Clerk, Beauport, and Director of Engineer Service headquarters, Ottawa. Cheque for 10 per cent. of amount must accompany each tender, made payable to Hon. Minister of Militia and Defence.

Banff, Alta.

Bath house. Dom. Govt. Dept. of the Interior. Secretary, Lyndewode Pereira. Architects, Painter & Swales, 553 Granville street, Vancouver, B.C. For erection of bath house. Plans, specifications, etc., at Commissioner Dom. Parks, Ottawa, Supt. Rocky Mountains Park, Banff, Chief Supt. Dom. Parks, Edmonton, Agents of Dom. Lands at Calgary, Regina and Winnipeg, and Architects. Tenders received by Secretary until noon May 30th, 1913.

Berlin, Ont.

Y. W. C. A. contemplated. Site has been selected on Frederick street, 66 x 192, and plans will be prepared.

Berriedale, Ont.

W. C. Brimacombe, Stirling Falls, Ont., will receive tenders until May 15th for erection of church, 24 x 36, stone basement, brick veneer construction.

Chatham, Ont.

Interior improvements to library, cost $4,000, contemplated by City Council (Library Board). Chairman, W. Park. New lighting system under consideration.

Calgary, Alta.

Children's shelter, cost $50,000, planned by city council. Clerk, J. M. Miller. By-law passed providing funds for purchase of land and erection of building.

Creemore, Ont.

Ratepayers carried by-law to raise $7,000 for Town Hall, fire hall, library and market building. Clerk, A. H. Watson.

Frelighsburg, Ont.

Alterations and addition to town hall planned by Municipal Council. Architect, C. E. White, 137 Wellington street, Sherbrooke. Tenders received by Secretary, H. Ingalls, until May 10th, 1913. Two storey addition, 35 x 70.

Gimli, Man.

School contemplated by the Town Council. Architect, F. R. Evans, 506 Somerset Bldg., Winnipeg, is preparing plans. Tenders will be called about May 14.

Gananoque, Ont.

Library and equipment, cost $7,500, contemplated. Clerk, S. McCammon. Plans in progress.

Guelph, Ont.

Masonic temple, Quebec street. Architects, Colville, Tanner Company. Three storeys and basement, 110 x 35, pressed brick, reinforced concrete, Indiana or Corinthian stone. Plans in progress.

Alterations and additions, cost $30,000, planned by Guelph General Hospital Board. By-law carried April 28th.

Montreal, Que.

Meurling municipal refuge. Tenders will be received by the Board of Commissioners, Secretary, L. N. Senecal, until noon, May 15th. Plans, etc., at office of Architect, Mr. Eugene Payette, 103 St. Francois Xavier street, for Refuge on Champ de Mars and St. Louis streets, East Ward.

Public buildings contemplated by the town council of Longueuil. Mayor, H. St. Mars.

Newboro, Ont.

Church for St. Johns Presbyterians. Tenders will be received by Secretary, Building Committee, W. S. Bilton. Architect, A. Stuart Allaster, Brockville. 1 storey, 45 x 30, stone and brick construction, stone foundation.

Ottawa, Ont.

Association building contemplated by the Young Women's Christian Assn. Per Sec., Metcalfe street. Plans will be prepared.

St. John, N.B.

Alterations, club house, Wellington Row, for The Elks Club, c/o Herbert J. Fleming, 130 Pond street. Architect, F. Neil Brodie, 42 Princess street, is preparing plans.

Saskatoon, Sask.

Tenders received by Commissioner, A. Bowen Perry, Regina, until May 10th, 1913, for R. N. W. M. P., for erecting building and officers quarters. Plans, specifications, etc., at office of Architects, Thompson & Crockett, Saskatoon.

South Edmonton, Alta.

College, east end, planned by Board of the Alberta College. Principal, Dr. Riddell. Site purchased, building will probably not be erected this year owing to financial difficulties.

Stratford, Ont.

Fair building, cost $10,000, Brittania. North Perth Agricultural Society. Sec., Jas. Stewart, Wellington street, Stratford. One storey, cement block construction, cement foundation. Stables will also be erected, wood construction. Plans in progress.

School basement, cost $11,000. Architect, Thomas Hepburn, has prepared plans. Cement foundation, concrete floors, heating.

Toronto, Ont.

Mr. Chas. J. Read, Confederation Life Bldg., desires tenders on all trades for the erection of Shea's new theatre. Tenders close Saturday, May 10th.

Masonic Temple, Spadina avenue, contemplated. President, J. Ross Robertson. Secretary, H. Leeson, 42 Colborne street.

Alterations to Broadway Tabernacle, College and Spadina. Pastor, Rev. W. H. Hincks, 53 Brunswick avenue. Chairman Board of Trustees, J. C. Baker, 333 Palmerston Blvd. New heating, ventilating and lighting system, also rearrangement of class rooms in basement. Plans in progress.

Unionville, Ont.

Club house for Unionville Lawn Bowling Club. Sec.-Treas., Abner Summerfelt. Committee appointed to select site and plans will be prepared.

Virden, Man.

Public building. Plans, specifications, etc., at office of H. L. Matthews, Supt. Arch. of Dom. Public Buildings, Winnipeg, at Post Office, Virden and Dept., Ottawa. Four storeys, basement and attic, stone and cement foundation, brick construction, concrete, tile and brick floors, felt and gravel roofing, cornices, electric lighting, hot water heating, plate glass. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works.

Windsor, Ont.

The city council contemplate the purchase of garbage incinerator. Mayor, Henry Clay. City engineer, M. E. Brian. Capacity 25 tons daily.

CONTRACTS AWARDED

Berlin, Ont.

Theatre, cost $25,000, for Leo. Longo.

Architect and builder, C. Cowan. Seating 1,200. Excavating started.

Dorchester, Ont.

School, cost $6,000, Sec. No. 4. Chairman, A. George. General contractor, E. McCann. Two storeys, 35 x 30, brick construction, stone and cement foundation.

Fort William, Ont.

Picture theatre, cost $15,000, Simpson, for Ben Ross, Corona Theatre. Architects, Carson & Smithley, Room 42, Murray Building. General contractor, J. A. Hamilton, Donald street. 44 x 100, structural steel and pressed brick construction. Foundations in.

Hamilton, Ont.

Sunday school, cost $30,000, Rebecca street, for Wesley Methodist Church. Pastor, Rev. E. A. Pearson, 137 Catharine north. Architects, Stewart & Witton, 2 Hughson street south. Mason, Mitchell & Riddell, 89 Sherman avenue north.

Hay Twp., Ont.

Church, cost $6,000, planned by Methodist Congregation. Mason, John Avery, Mitchell, Ont. Carpenter, Wm. Eizerman, Mitchell. Stone and cement foundation, white brick construction.

Marysville, N.B. (York Co.)

Church planned by Methodist Congregation. Pastor, Rev. Thomas Hicks. General contractor, Alfred C. Higgs, Nappan, N.S.

Montreal, Que.

Moving picture theatre, cost $19,000 Owner and builder, C. J. Stuart, Laurier avenue. One storey, 52 x 97. Excavating started.

Moose Jaw, Sask.

Armory, cost $106,000, Main street. Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Navin Bros., Main and River street. 250 x 138, structural steel, brick and stone construction.

Oak Bay, B.C.

School, Monterey avenue. Architect, C. E. Watkins, Green Block, Victoria. General contractors, Messrs. Luney Bros., 508 Sayward Building, Victoria, $57,956.50. Heating and ventilating, R. J. Nott & Company, Quadra and Mason streets, Victoria, $6,292.

Petrolia, Ont.

Theatre and flats, cost $8,000, for Thompson & Jones, Nothville, Mich. Architects, Varney & Varney, Detroit. Work, day labor. Will purchase new motion picture machine and complete outfit, also piano, stage, scenery, etc. Two storeys, 110 x 21, structural steel, white and red brick construction.

Point Grey, B.C.

School, cost $64,040, Magee. Architect, Claude P. Jones, 429 Pender street west, Vancouver. General contractor, S. J. Lund, 603 Hastings street west, Vancouver. Eight rooms, brick construction.

Port Arthur, Ont.

Arsenal. Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, G. W. Tharle, G. W. Brown and A. C. Stewart, of Fort William, Ont.

Preston, Ont.

School, cost $7,000, for Separate School Board. General contractor, Geo Roth. Two storeys, stone trimmings, stone and cement foundation.

Toronto, Ont.

Church, cost $60,000, Gerrard and Degrassi, for St. Ann's (R.C.) congregation. Rev. Father O'Donnell, 240 Bolton ave. Architect, A. W. Holmes, 10 Bloor street east. General contractor, W. A. McNeil, St. Mary's, Ont., will sublet, now open for tenders.

Theatre, cost $10,000, 700 Queen east, for Jas. Thompson (in trust). Architect, Jas. Thompson, 43 Victoria street. Mason, Thos. Brick & Son, 716 Broadview avenue. Two storeys. Foundations in.

Vancouver, B.C.

School, cost $51,519.54, Henry Hudson. General contractors, R. McLean & Company, 744 Hastings street west. Plumbing, The Royal Plumbing & Heating Co., 123 Dufferin street. General contract was relet on account of contractor withdrawing from contract. Public School Board. Secretary, Gerald Upton, H.H.

Winnipeg, Man.

Market, in rear of Industrial Bureau, planned by The Million for Manitoba League, c/o Industrial Bureau. Architect, P. C. Samwell, 516 Builders' Exchange. General contractors, J. McDiarmid Company, Limited, Canada Building. Two storeys, 150 x 50, concrete foundation, frame construction.

Business Buildings and Industrial Plants

Brantford, Ont.

Addition to hotel, cost $7,000, Colborne, for Champion Estate. Manager hotel, W. H. Littlefield, Kerby House. Tenders received by Architects, Taylor & Taylor, Hope Chambers, until May 8th. One storey addition, 100 x 36, clay brick construction, Brantford roofing.

Edmonton, Alta.

Tom Rookes, Alberta Hotel, is planning some extensive changes in connection with bar of his hotel. Work will be done at once.

Hamilton, Ont.

Stores and hall, cost $30,000, Main St., for Royal Templars of Temperance, Spectator Building, Architect, W. A. Edwards, 2 Hughson street south. Cement foundation, brick and structural steel construction. Plans prepared.

Stores and apartments, cost $10,000, east end, for W. R. Turnbull, 42 Ontario street. Architects, Stewart & Witton, 2 Hughson street south. Tenders will be called for at once. Three storeys.

Garage, for W. A. Holton, 50 Robinson street. Architect, Stewart McPhie, Bank of Hamilton Building. One sty., 20 x 30, brick, stone foundation. Plans in progress.

Lindsay, Ont.

Addition to plant of Canadian Boving Company, 164 Bay street, Toronto. Company will manufacture hydraulic and paper-making machinery. Plans in progress.

London, Ont.

Store addition, cost $4,500, for E. E. Linnell (grocer), Hamilton road and Marmora street. White brick construction. Plans in progress.

Ottawa, Ont.

Garage, cost $8,000, Slater street, for Ottawa Electric Railway Company. Supt., Mr. Burpee. Architect, J. Albert Ewart, 193 Sparks street. 36 x 64, cement foundation, solid brick construction, concrete floors. Plans ready.

Regina, Sask.

Engine and boiler house, cost $6,000, for Regina Brewing Company, Dewdney street. One storey, 26 x 60, Redcliffe brick, cement foundation, concrete and fireproof floors. Plans drawn.

St. John, N.B.

Warehouse, contemplated for Frank Likely, 99 Marsh road. Plans will be prepared.

Three Rivers, Que.

Bank building (Notre Dame and Alexander streets), planned for Canadian Bank of Commerce, head office Toronto, Ont. Site has been purchased, building will be erected immediately.

Tillsonburg, Ont.

Shoe factory, contemplated for Snedicer-Hathaway Shoe Company, Detroit, Mich. By-law carried, granting $25,000 and free site. Plans will be prepared.

Toronto, Ont.

Warehouse, cost $8,000, Pape avenue, for Grasselli Chemical Company, 131 Eastern avenue. Manager, R. J. Chute. One storey, 30 x 45, structural steel and brick construction, cement foundation.

Windsor, Ont.

Addition to hotel, cost $6,000, contemplated by Charles Stephens, Stephens Inn, Windsor. White brick construction. Plans in progress.

CONTRACTS AWARDED

Edmonton, Alta.

Store and apartments, cost $35,000, for Jno. Hagmann, 789 Fraser avenue. Architect and builder, T. C. Pennie, P.O. Box 431. Three storeys and basement, 93 x 40, sandlime and pressed brick, structural steel, artificial stone trimmings, cement foundation. Foundations started.

Warehouse, cost $110,000. Architects and general contractors, N. Purcell, of Purcell & Foots, and Mr. Kelly, of Kelly & Moore. Four storeys, concrete foundation, brick and structural steel construction, tar, felt and gravel roofing. Excavating started.

Hamilton, Ont.

Addition to factory, cost $5,000, Stuart, for Gartshore-Thomas Pipe & Foundry Company, Stuart street. General contractor, R. Tope, 191 Robinson street. Iron and steel, Hamilton Bridge Works Company.

Bank building and office, cost $15,000, Barton east, for Royal Bank of Canada, Toronto. Architect, Kenneth G. Rea, 54a Beaver Hall Hill, Montreal, Que. General contractor, Richard Tope, 191 Robinson street. Supt., B. F. Richardson, 60 Market street. Two storeys, 65 x 48, cut stone and brick construction, cement foundation.

Two stores and apartments, cost $10,000, for D. Shapiro, 375 Sherman avenue north. Builder, J. D. Corrigan, 231 Catharine street north. Three storeys, brick.

Factory extension, cost $250,000, Terra Cotta avenue, for Fowler's Canadian Co., Wentworth street north. General contractors, [illegible] Ill.

McGregor, Ont.

Canning factory, cost [illegible], for

Morand Canning Company, Limited. President, Paul Morand, Tecumseh, Ont. General contractor, Alfred Grendeau, Tecumseh. Carpenter, Jos. Allard, St. Joachim. Two storeys, 40 x 160, reinforced concrete construction, cement foundation.

Ottawa, Ont.

Mica factory, cost $5,000, Creighton street. General contractors and architects, Blackburn Bros., Sparks street. 60 x 70, brick veneer construction, cement foundation. To replace building recently destroyed by fire.

Offices, cost $5,300, Laurier west, for O'Conner Estate, c/o Architect, W. E. Noffke, Central Chambers. General contractors, Alexander & Campbell, 587 Lisgar. Solid brick construction, stone foundation.

Alterations to stores and apartments, cost $4,000, Laurier east, for Dr. Leggett and others, Elgin street. Architect, W. Herbert George, Castle Building, Queen street, is preparing plans. Brick construction.

St. Catharines, Ont.

Bakery, cost $3,000, for A. Meyer Co., Ltd., 87 Lake street. General contractors, Nicholson Bros. Two storeys, 36 x 60, brick construction.

Stratford, Ont.

Stores, cost $10,000, Brunswick. Owner and general contractor, Mr. Wm. Gordon, Albion Hotel. Architect, Thos. Hepburn, c/o owner. Two storeys and basement, 40 x 110, red brick construction, stone foundation. Excavating started.

Toronto, Ont.

Mr. John M. Lyle, 14 Leader Lane, has awarded the following contracts on the Sterling Bank: Masonry, Messrs. Smallwood Bros. Carpentry, Mr. J. Doherty.

Victoria, B.C.

Stores and apartments, cost $22,000, for E. J. Blaquire, 1721 Quadra street. Architect, H. J. Rous Cullin. General contractors, Luney Bros., Limited, 508 Sayward Building. Three storeys, structural steel and brick construction.

Windsor, Ont.

Bank, store and flats, cost $10,000, Wyandotte street, for A. J. Campeau. Architects, G. Jacques & Company, Boug Building. Mason, Geo. Sewell. Other contracts not yet awarded. Two stys., 50 x 60.

Winnipeg, Man.

Laundry, Cost $10,000. Architect and builder, R. J. Barker, 59 Pearl street. 2 storeys, stone foundation, brick construction. Plans in progress.

Residence, cost $4,300, for W. J. Haggart, Main street. 2½-storeys, stone foundation, brick veneer construction. Plans in progress.

Winnipeg, Man.

Residence, cost $8,000, for Dr. H. J. Christie. Architect, F. R. Evans, 506 Somerset Bldg. 2½ storeys and basement, brick veneer construction, stone foundation. Tenders called.

Apartment block, cost $60,000, Winnipeg ave., for Mrs. A. Jameson, Portage ave. Architect, P. C. Samwell, 516 Builders' Exchange. Three storeys, 63 x 70, brick construction, stone foundation. Plans ready; permit issued.

Residence, cost $10,000, for W. E. Tastrack, 78 Cathedral. 2½-storeys, 30 x 28, frame, stone foundation. Plans drawn.

Two residences, cost $8,000, Morley, for A. Simpson, corner Alloway and Marland. Two storeys, 22 x 24, frame, stone foundation. Plans drawn.

Residences

Hamilton, Ont.

Residence, cost $4,000, Dundas Road, for Dr. F. M. Binkley, 17½ King St. E. Tenders received by Architect, W. A. Edwards, 7 Hughson street south. 2½ storeys, 32 x 41, stone foundation and construction.

Montreal, Que.

Pair residences, cost $20,000, Lansdowne, Westmount, for D. Farrell, 567 Grosvenor. Plans drawn.

Pair semi-detached residences, cost $15,000, Westmount (Lansdowne), for Isaac Collins, 207 Ash avenue. Brick construction. Plans drawn.

Pair residences, cost $22,000, Argyle, for C. N. Blakeley, Room 10, Westmount Commercial Building. Plans drawn.

Ottawa, Ont.

Two residences, cost $12,000, 1st ave., for Lincoln Johnston, 84 4th ave. 25 x 36, brick construction, stone foundation, Plans in progress.

Residence, cost $6,000, for B. A. Greson, 100 Fentiman. 35 x 37, double brick construction, stone foundation. Plans in progress.

Residence, cost $8,000, for C. S. Smith, 289 Clemow. Architects, Keefer, Richards and Abra, 229 Sparks street. 2½-storeys, 35 x 38, stone foundation, brick veneer construction. Plans in progress.

Residence, cost $4,000, for Charles Wood, Cameron street. Stone foundation, brick construction. Plans in progress.

St. John, N.B.

Apartment house for C. Brager, 48 Mill street. Architect, Garnet Wilson, Princess street, is preparing plans. 3-storeys, 4 apartments, concrete foundation, frame construction.

Toronto, Ont.

Residence, cost $25,000, Warren & Lonsdale Roads, for H. Winnett, 198 Beverley. Architect, F. S. Baker, Traders Bank Bldg. Masons, Gordon Bros., 249 McCaul. 40 x 60, stone construction and foundation. Plans drawn.

Men's rooming house, cost $20,000, 164 Huron street. Tenders received by W. E. Dyer, 235½ College street. 3-storeys, 72 x 25, structural steel, reinforced concrete and brick construction.

One detached residence, cost $7,000, Indian road, for W. V. Dixon, 259½ Yonge street. 2½ storeys, 24 x 40, brick construction, brick foundation. Plans ready.

One detached residence, cost $10,000, storeys, 50 x 63, cement foundation, Dowlish, for Jas. Nelson (in trust), 346 Palmerston. Architects, Eden Smith & Sons, 199 Yonge street. 2½-storeys, 41 x 50, brick construction, brick and stone foundation. Plans drawn.

Residence, cost $9,000, Avenue road, for Dr. C. A. Risk, 436 Yonge street. Architect, C. M. Willmot, 436 Yonge street. 2½-storeys, 30 x 55, structural steel and brick construction, brick foundation. Plans drawn.

One detached residence, cost $4,000, Balmoral avenue, for W. R. Willis, Broadway avenue. Architect, C. Willmot, 436 Yonge street. 2½-storeys, 23 x 36, brick construction and foundation. Plans drawn.

One detached residence, cost $4,500, Farnham avenue, for Anglins, Limited, 507 Lumsden Building. 2½-storeys, 23 x 36, brick construction, stone foundation. Plans drawn.

Windsor, Ont.

Residence, cost $6,000, Ouellette, for T. J. Wear, Pelissier street. Tenders received by Architects, Crane & Pennington, Boug Building, until May 12th. Two storeys, 31 x 31, vitrified brick and stucco construction, brick foundation.

Westboro, Ont.

Residence, cost $4,500, Birch, for John Scobie. Two storeys, stone foundation, brick veneer construction. Plans drawn.

Residence, cost $4,000, Highland Park, for H. P. Allen, Florence street. 2½-storeys, stone foundation, brick construction. Plans in progress.

CONTRACTS AWARDED

Charlottetown, P.E.I.

Residence, cost $5,000, Fitzroy, for Alex. Horne, Queen street. Architect, C. B. Chappell. General contractors, H. & S. Lowe. Two storeys, 32 x 40, cement foundation, frame construction. Excavating done.

Edmonton, Alta.

Residence, cost $8,500, New Glenora. Builder and architect, G. H. Eaton, 430 15th street. General contractors, Read, MacDonald & Brewster, Ltd., 619 4th street. 2½ storeys, 35 x 40, frame, cement and concrete foundation. Foundations in.

Hamilton, Ont.

Two residences, cost $8,000, Beulah ave. Owner and general contractor, W. H. Northcote, 28 Mount Royal Avenue. Stone foundation, pressed brick construction. Permit granted.

Montreal, Que.

Cottage, cost $6,000, St. Lambert (St. Denis), for C. F. Fisher, Stanley street. Architects, Peden & McLaren, 20 St. Alexis, Montreal. General contractor and mason, Alp. Gravel, St. Lambert. Foundations started.

Residence, cost $5,000. Owner and builder, E. P. Gordon, Victoria avenue, St. Lambert. Two storeys, 72 x 20, concrete foundation, encased brick construction, felt and gravel roofing. Excavating started.

Six flats, cost $14,000, Decarie avenue. Owner and builder, A. Savard, 460 Gilford. Three storeys, 25 x 38. Excavating started.

Nine flats, cost $7,000, Lacasse. Owner and builder, Geo. Paquette, 148 Park. Three storeys, 48 x 80, felt and gravel roofing. Excavating started.

Seven flats, cost $28,000. Owner and builder, Jos. St. Pierre, 103 Fort street. Three storeys, 47 x 62. Excavating done.

10 flats, cost $10,000. Owner and builder. Aug. Laporte, 812 Rivard. Three storeys, 50 x 50. Excavating started.

12 flats, cost $8,000, Bordeaux. Owner and builder, S. A. Dubuc, 1055 Cartier. Three storeys.

Eight flats, cost $12,000, St. Martin. Owner and builder, Jos. Bonhomme, 200

Guy. Three storeys, 55 x 42, felt and gravel roofing.

Two residences, cost $11,500, Grey. Owner and builder, Chas. J. Brown, 4263 St. Catherine west. Two storeys, 46 x 43, felt and gravel roofing.

Residence, cost $5,000. Owner and builder, O. Denault, 52 Girouard avenue. Two storeys, 25 x 35. Excavating started.

Seven flats, cost $15,000, St. Luke. Owner and builder, Jos. St. Pierre, 103 Fort street. Three storeys, 37 x45. Excavating done.

Two residences, cost $13,500, Grey. Owner and builder, Chas. J. Brown, 4263 St. Catherine west. Two storeys, 48 x 47, felt and gravel roofing. Excavating started.

Ottawa, Ont.

Apartment, cost $5,500, for Jas. McIntosh, 171 Frank. General contractor, J. R. Howe, 324 Mutchmore. 40 x 28, stone foundation, brick veneer construction.

Residence, cost $5,400, Bronson, for L. R. Gauthier, 285 Mutchmore. General contractor, Francis Lefaibre, 780 Somerset. Stone foundation, brick veneer construction.

Residence, cost $7,000, Powell, for John A. Bell, 344 Waverley. Architect and general contractor, Geo. Tomlinson, 348 Waverley. Mason, Geo. A. Eaman & Sons, Isabella street. Carpenter, Wm. Saunders. 26 x 36, brick construction, stone foundation.

Residence, cost $7,000, Carling, for A. E. McCormack, 77 McLaren. Architect, W. Herbert George, Castle Building, Queen street. Mason, Thos. James, 140 Flora. Carpenter, Saunders Bros. 31 x 38, brick construction, stone foundation.

Quebec, Que.

Residence, cost $6,000, for Samson & Filion, 10-14 Ancien Chantier. Architects, Talbot & Dionne, St. Joseph St. General contractor and carpenter, P. A. Lamonde, 52 St. Francois. Mason, A. Jinchereau. Roofing, P. Lachance, 137 St. Paul. Painting, heating, plumbing and electrical work by day labor. Six storeys, 60 x 80, stone foundation, red brick construction.

Residence, cost $4,500, for George Cote, Lockwell street. Builder and general contractor, A. Mercier. Iron and steel, L. H. Gaudry & Company, 76 St. Pierre. Three storeys, 50 x 60, stone foundation, Scotch brick and structural steel construction.

Residence, cost $6,000, for A. Robitaille, 21 Burton street. Builder and general contractor, A. Mercier. Iron and steel, L. H. Gaudry & Company, 76 St. Pierre. Four storeys, 60 x 75, stone foundation, Scotch brick and structural steel construction. Excavation started.

Residence, cost $5,000, Turnbull. Builder and general contractor, A. Nadeau, Turnbull street. Three storeys 40 x 55, stone foundation, Scotch brick and structural steel construction. Excavating started.

Sarnia, Ont.

Residence, cost $[illegible], [illegible] and [illegible] street, for W. H. [illegible], Maria street. Architect and general contractor, D. W. Giffin, 389 Maxwell street. [illegible] storeys, brick foundation and construction.

Toronto, Ont.

One detached residence, cost $6,500, Alberta, for J. Tanner, 337 Palmerston Blvd. Architect and builder, S. Cooper, 81 Melville ave. 2½ storeys, 23 x 36, brick and cement foundation.

One detached residence, cost $6,500, Parkwood road, for A. Greig, St. Clair and Oriole road. Builder, C. Lanskail, 354 Huron. 2¼-storeys, 33 x 36, brick construction and foundation.

Residence, cost $8,500, High Park Gardens, for J. A. Dyment, c/o Architects, Wickson & Gregg, Kent Building. Mason, N. E. McGregor & Company, 158 Geoffrey. Carpenter, H. C. Appleton, 737 Bathurst street. 2½-storeys, 28 x 34, stone and brick construction, stone foundation.

Residence, cost $6,000, Wells Hill, for Miss McDonald, 6 Park Place. Architects, Designing and Draughting, 36 Toronto street. General contractors, W. Halls & Son, 6 Park Place. 2½-storeys, 34 x 33, brick construction, brick and stone foundation.

Two flat apartments, cost $5,000, for J. C. Corti, 421 Markham street. Mason, Cordy Bros. Carpenter, W. C. Owen, 227 Dovercourt road. Brick construction, stone foundation. Foundations in.

Windsor, Ont.

Residence, cost $6,000, Ouellette, for A. J. Walker, 107 Douglas. Architects and general contractors, Lambert & Braithwaite, 6 Riviere avenue, Sandwich. Two storeys, 33 x 32, brick construction. Foundations in.

Waterloo, Ont.

Residence, cost $7,500, for A. E. Sanderson, Young street. Mason, Steckenreiter & Koening. Carpentry, Reitzel Bros. Plumbing and heating, Conrad Bros. Two storeys, 38 x 42, pressed brick construction, stone foundation.

Westboro, Ont.

Residence, cost $4,800, Prospect. Owner and general contractor, B. Bigford. 2½ storeys, brick veneer construction. Foundations in.

Winnipeg, Man.

Two residences, cost $10,000 each. Architects and general contractors, Baldry Engineering & Construction Co., 507 Builders' Exchange Bldg. 2½ storeys and basement, concrete foundation, pressed brick construction. Excavating started.

Residence, cost $10,000, Niagara. Architects and builders, Sparrow Bros., 340 Dromore ave. Two storeys, 36 x 33, frame, stone foundation. Excavating done.

Apartment block, cost $20,000, Beresford avenue, for M. T. McKittrick, cor. Beresford and Nassau. General contractor and architect, J. W. Parker, 473 Beresford. Three storeys, 26 x 68, brick, stone foundation. Excavating started.

Residence, cost $9,000, Grosvenor. Builder and architect, W. A. Cameron, [illegible] Wellington street. [illegible] storeys, [illegible] x 32, brick veneer, stone foundation. Excavating started.

Residence, cost $[illegible], [illegible]. Builders and architects, Western Builders' Limited, 609, Somerset Block. 2½-storeys, 27 x 34, frame, stone foundation. Excavating started.

Residence, cost $11,700, Oxford, for R. [illegible], [illegible]. Builders, [illegible]

patrick, 625 Broadway. 2½-storeys, 42 x 39, red, pressed brick, stone foundation. Excavation done.

Power Plants, Electricity and Telephones

Montreal, Que.

Canadian Pacific Railway Company, Davidson street, is in the market for 20 more electric motors, from 5 to 50 h.p. Engineer, Mr. Baer, Angus shops.

Regina, Sask.

Power house and laundry, cost $10,000, planned by City Council. Architect, M. R. Darrack, Western Trust Bldg. General contractor, R. J. Lecky. Two sty., 66 x 40, cement and brick foundation, structural steel, reinforced concrete and brick construction.

Saskatoon Sask.

Tenders received by Sec.-Treas., H. H. Elliot, M.D., till May 20th, 1913. Consulting Engineers, Murphy & Underwood, Montreal, Toronto and Winnipeg. "B" for supply, delivery and erection of 2 generators, exciters, switch and apparatus. "A" supply, delivery and erection of 2 crude oil engines. Plans, specifications, etc., at offices of Consulting Engineers.

South Edmonton, Alta.

Electric lighting plant, outside city limits, contemplated by a Syndicate (Leather & Shoe Co.) President, A. C. Todd. Vice-president, J. M. Douglas, 155 Saskatchewan avenue. Secretary-Treasurer, A. L. Marks, 648 6th avenue north-east. Company will instal independent plant to provide light and power for factory.

Windsor, Ont.

Electric lighting equipment, planned by city council. Clerk, Stephen Lusted. Contract for 125 standards at $52.50 each, awarded to R. E. Pringle, Toronto, agent for The Adams Bagnell Company.

Winnipeg, Man.

Gas testing station, cost $3,205, contemplated. Engineer, H. N. Ruttan, 223 James ave. Three testing and four pressure recording stations have been recommended by Public Utilities Commissioner. Board of Control, Secretary, M. Peterson.

Board of Control plan ornamental street lighting on Main street north from subway to north city limits. Two lamp suspension type poles to be used and to provide for carrying street railway span wires. Resolution has passed Fire, Water, Light & Power Committee. Secretary, M. Peterson. Engineer, J. G. Glassco, 54 King street.

The Canadian Westinghouse Company, Limited, Portage avenue east, have been awarded contract for 3-500 kw. transformers for No. 1 sub-station King St., and 3-500 kw. transformers for terminal station on Rachel street.

Miscellaneous

Montreal, Que.

Machinery. [illegible] Brick Company, Transportation Building, [illegible] purchasing brick-making plant, sand lime presses, etc., motor truck 5 to 7 tons, [illegible]. [illegible] Mr. Henriels.

Continued on page 77

Tenders and For Sale Department

CITY OF REGINA

SEWERS

Sealed tenders addressed to the City Commissioners, Regina, Sask., will be received up until 12 o'clock noon, **May 15th, 1913**, for the following materials and works:—

(A) Supply and delivery of approximately:—

5,000 lineal feet of 6-in. sewer pipe.
50,000 lineal feet of 8-in. sewer pipe.
20,000 lineal feet of 9-in. sewer pipe.
1,500 lineal feet of 10-in. sewer pipe.
15,000 lineal feet of 12-in. sewer pipe.
2,500 lineal feet of 15-in. sewer pipe.
7,000 lineal feet of 18-in. sewer pipe.
2,500 lineal feet of 24-in. sewer pipe.

(B) Supply and delivery of approximately:—

1,735 lineal feet of 30-in. concrete pipe.
1,025 lineal feet of 36 in. concrete pipe.
1,300 lineal feet of 42-in. concrete pipe.

(C) Supply and delivery of approximately:—
450,000 sewer brick.

(D) Supply and delivery of approximately:—
2,000 bbls. of cement.

(E) Supply and delivery of approximately:—
260 manhole covers.

(F) Supply and delivery of approximately:—
1,000 cubic yards of sand.

(G) Labor for laying sewers.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender. The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

16-19 F. McARTHUR, City Engineer.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Customs Building, Ottawa, Ont.," will be received until 4 p.m., on **Wednesday, May 21, 1913**, for the construction of a Customs Building on Mackenzie Avenue, Ottawa, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of R. L. Deschamps, Esq., 103 St. Francois Xavier street, Montreal, and of Thos. Hastings, Esq., Clerk of Works, Postal Station "F," Yonge street, Toronto, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, for the sum of seventy-five thousand dollars ($75,000), which will be forfeited if the persons tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted, the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, April 22, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40459 18-19

CITY OF ST. THOMAS

TENDERS

Tenders will be received by Geo. K. Crocker, Chairman of the Board of Water Commissioners, up till 12 a.m., **Thursday, May 15th**, for the following:—

(a) Excavation and back filling required for the laying of 16,000 feet of water mains.

(b) Laying the mains and pouring the joints.

Specifications and full particulars may be had from M. Ferguson, City Engineer, St. Thomas, or the office of the Contract Record and Engineering Review, Toronto, Ont.

S. O. PERRY,
Sec.-Treas., Board of Water Commissioners,
St. Thomas, Ont.

April 24, 1913. 18-19

Extension of Time for Tenders for Bridge Construction

Sealed tenders, plainly marked as to contents, will be received at the office of the undersigned, up to noon of **Monday, May 19, 1913**, instead of May 9th, for the construction of concrete abutments and concrete bridge floor or concrete piers and concrete shore spans and bridge floor, over the Nottawasaga River between the Townships of Essa and Sunnidale near Angus, Ont.

Plans and specifications and all necessary information may be obtained at the office of the undersigned, 57 Adelaide street east, Toronto; office of Mr. R. H. Tupp, County Engineer for Simcoe, at Orillia, Ont., and at the office of Mr. Richard Bell, Angus, Ont.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Consulting Engineer.

19

CITY OF FORT WILLIAM

Waterworks Tunnels

Sealed tenders, addressed to the City Clerk and endorsed "Tenders for Tunnels," will be received up to 12 o'clock noon on **Thursday, May 29th, 1913**, for the construction of three tunnels in Hudson Shale, etc., with reinforced concrete lined shafts, viz.:

Tunnel under Kaministikwia River, **1,275** ft. long, **7** ft. wide, **8** ft. high, **119** ft. deep.

Tunnel under Mission River, **677** ft. long, **5** ft. wide, **6** ft. high, **95** ft. deep.

Tunnel under McKellar River, **629** ft. long, **5** ft. wide, **6** ft. high, **91** ft. deep.

Plans and specifications may be seen and forms of tender may be obtained at the office of T. Aird Murray, Esq., 303 Lumsden Bldg., Toronto, Ont.

Tenders must be sent in on form supplied. The lowest or any tender not necessarily accepted.

A. McNAUGHTON, City Clerk,
Fort William, Ont.

RAY R. KNIGHT, City Engineer,
Fort William, Ont.

T. AIRD MURRAY, Con. Eng.,
Toronto, Ont.

Fort William, April 26, 1913. 18-21

CITY OF PORT ARTHUR

Tenders for Waterworks Department

Sealed separate tenders, for each section will be received by the undersigned up to 5 o'clock p.m. of **Monday, May 12th, 1913**, for the construction of sections **1** to **10** inclusive of the new Force Main.

The work includes the trenching necessary, the laying of steel piping, valves, specials, etc., and constructing valve chambers.

Approximate quantities:—
Trenching and laying 12-in. steel pipe, **6,000** ft.
Trenching and laying 24-in. steel pipe, **40,000** ft.
in single and double trench.

Trenching and laying 2,500 ft. duplicate 24-inch intake in Lake Superior.

Material supplied by the Corporation.

Plans and specifications can be seen at the office of T. Aird Murray, 303 Lumsden Building, Toronto, or at office of L. M. Jones, City Engineer, Port Arthur, Ont.

A marked cheque for five per cent. of the cost of the work must accompany each tender.

The lowest or any tender not necessarily accepted.

J. J. HACKNEY.

Corporation Offices, Port Arthur,
April 21st, 1913. 18-19

Tenders for Power Plant Equipment

Sealed tenders, registered and endorsed on the envelope, Tender for (tender bidden on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the town of the Pas, will be received up to 6 p.m., **May 20th, 1913**, for the supply and delivery of the following machinery and materials:—

Tender "A"—For the supply, delivery and erection of two crude oil engines.

Tender "B"—For the supply, delivery and erection of two generators, exciters, switch, and other apparatus.

Tender "C"—For the supply and delivery of, approximately,

4400 ft. of 12-in. steel pipe or cast iron pipe.
3500 ft. of 10-in. steel pipe or cast iron pipe.
4400 ft. of 8-in. steel pipe or cast iron pipe.
2000 ft. of 6-in. steel pipe or cast iron pipe.
50 specials.

Tender "D"—For the supply and delivery of 30 hydrants, 52 gate valves, and boxes.

Tender "E"—For the supply and delivery of two pneumatic storage tanks.

Marked cheque for five per cent. (5 p.c.) of the amount of the tender must accompany each bid. The lowest or any tender not necessarily accepted.

For the supplying of materials, the tender forms must be filled in, copies of which are attached to the specifications, or are obtainable at the Consulting Engineer's offices.

Plans and specifications may be seen at the offices of the Consulting Engineers, Saskatoon, Sask., "The Canadian Engineer," Toronto, Winnipeg and Montreal, or a complete set of plans and specifications for any contract will be given, or forwarded, on a deposit of Twenty-five ($25) Dollars, and a set covering all the contracts on a deposit of One Hundred ($100) Dollars. If the prospective bidder sends in a bid on the tenders asked for, the deposit will be returned when the plans and specifications are returned.

H. H. ELLIOTT, M.D.,
Secretary-Treasurer,
The Pas.

Murphy & Underwood,
Consulting Engineers,
Saskatoon, Sask. 18-20

Tenders Wanted

Sealed tenders, whole or separate, will be received by the undersigned up to and including the **15th day of May, 1913**, for all trades required in the erection and completion of a Public Library Building at Walkerton, Ont.

Plans and specifications can be seen at the office of the undersigned, Walkerton, Ont., on and after this date, or at the office of Geo. Gray, architect, Harriston, Ont.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
17-19 Chairman Library Board.

CITY OF REGINA

Tenders for Trenching and Laying Water Mains

Sealed tenders, marked "Laying of Water Mains," will be received by the City Commissioners, Regina, Sask., up till noon, **May 12th, 1913**, for the Trenching and Laying of Water Mains, on certain streets in the City of Regina.

Specifications and other information may be obtained at the office of the undersigned.

A marked cheque covering **5** per cent. (five per cent.) of the tendered amount must accompany each tender.

Any or all tenders not necessarily accepted.

J. M. MACKAY,
17-19 Superintendent of Waterworks.

CITY OF STRATFORD

Tenders for Main Sewer

Sealed tenders, endorsed "Tender for Main Sewer Construction, will be received by the undersigned up to 12 o'clock noon of Tuesday **May 20th, 1913**, for the supply of material and the construction of approximately one mile of sanitary sewer.

Plans, specifications, forms of tender and all necessary information may be procured at the office of The Contract Record, Toronto, or at the office of the City Engineer, Stratford.

A certified cheque for 2 [illegible] of the amount of tender, payable to the order of the Treasurer of the City of Stratford, must accompany each tender.

The City reserves the right to reject any or all tenders.

A. B. MANSON,
19-20 City Engineer.

Board of Education

TOWN OF BARRIE

Tenders in bulk or separate, will be received at the office of the undersigned until twelve o'clock noon of the **15th day of May, 1913**, for the several works required in the alterations and additions to the Collegiate Institute, Barrie, Ont. A certified cheque for 10 per cent. of the amount of the tender [illegible] be forfeited should the contractor fail to sign contract. Plans and specifications may be seen at the office of Stewart & Witton, architect, Hamilton, Ont., and of the undersigned. The lowest or any tender not necessarily accepted.

FRED MARR,
Secretary-Treas., Board of Education,
18-19 Barrie, Ont.

TENDERS

Will be received up to and including **Monday, May 12th, 1913**, by the undersigned, for bulk or separate tenders for the proposed eight-roomed school in the Town of Galt.

Plans and specifications may be obtained from H. G. Fulford, Architect, Galt. Phone 323.

JOHN PERRY,
19 Secretary-Treasurer.

Heating and Sprinkler Equipment

Tenders Wanted

Sealed tenders, addressed to the undersigned, 556 Ridout street, London, Ont., will be received up till noon, **Wednesday, May 14th, 1913**, for heating and sprinkler equipments for the new plant of the McCormick Mfg. Co., London.

Plans and specifications may be seen at my Toronto office, 36 Toronto street, or at 556 Ridout street, London.

Lowest or any tenders not necessarily accepted.

H. P. ELLIOTT.
Toronto, May 12, 1913 19-19

Department of Railways and Canals, Canada.

TRENT CANAL

Notice to Contractors

Lock Gates, Ontario-Rice Lake Division

Sealed tenders, addressed to the undersigned, and marked "Tender for Lock Gates, Trent Canal," will be received at this office until 16 o'clock on **Monday, May 26th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after April 23rd, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of Superintendent Engineer, Trent Canal, Peterborough, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of [illegible] 600 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 22nd April, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—40626 18-19

TOWN OF DUNNVILLE, ONT.

Board of Waterworks Commissioners

Sealed tenders addressed to B. L. Edgecombe, Chairman of the Water Commission, will be received up to 9 p.m., on the **31st of May, 1913**, for the laying of approximately 10,000 feet of water mains, all materials to be supplied by the Water Commission.

Specifications and instructions to bidders to be had on application to the undersigned.

ROBERT G. KYD.
19-20 Superintendent.

CITY OF REGINA

Pavements and Sidewalks

Sealed tenders addressed to the City Commissioners, Regina, will be received up until 12 o'clock noon, **May 15th, 1913**, for the following works:

- (A) Approximately 150,000 sq. yds. of street pavement.
- (B) Approximately 32,000 sq. yds. of track pavement.
- (C) Approximately 80,800 lineal feet of crub and gutter.
- (D) Approximately 2,300 lin. ft. of straight curb.
- (E) Approximately 558,000 sq. ft. of concrete sidewalk.

All information regarding the above may be obtained on application to the City Engineer.

A marked cheque for five per cent. of the amount of the bid must accompany each tender.

The City reserves the right to divide each of the works into two or more contracts, and to reject any or all tenders.

16-19 F. McARTHUR, City Engineer.

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, May 13th, 1913**, for the construction of the following works:—

SEWERS

Glen Ave., from Yonge St. to 550 ft. east;
Elmer Ave., from 950 ft. N. Queen to Norway Pl.;
Lane 1st W. of York St., Richmond to S. End.;
Lane 1st S. of Dundas St., Mavety to 140 ft. E.
Kenilworth Creek Storm Sewer No. 3.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a Guarantee Company, approved of as aforesaid.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

[illegible] HOCKEN, Mayor,
Chairman, Board of Control.
City Hall, Toronto,
May [illegible], 1913. 19

Tenders Wanted

[illegible] will be [illegible] by the undersigned [illegible] Thursday May 15th 1913, for the erection [illegible] brick school [illegible] the High [illegible]

[illegible] marked [illegible] of tender. Lowest or any tender not necessarily [illegible]

Plans and specifications may be obtained at [illegible]

Edmonton Public School Board,
[illegible] Edmonton, Alta

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect. No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Wharf and Dredging at Belleville, Ont.," will be received at this office until 4 p.m. on **Tuesday, May 20, 1913**, for the construction of a Wharf and Dredging at the city of Belleville, County of Hastings, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department, and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, P.Q., and on application to the Postmaster at Belleville, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be [illegible]

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the persons tendering dceline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted, the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, April 21, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40376. 18-19

Tenders for Dredging

Toronto, Canada

The Toronto Harbor Commissioners have in preparation plans and specifications for the removal of approximately 35,000,000 cubic yards of material by hydraulic dredging.

Borings indicate seventy per cent. of material to be sand and gravel, thirty per cent. mixture of sand, silt and clay.

Each dredge must be capable of handling at least 600 cubic yards per hour at maximum length of discharge.

From source of supply to point of discharge maximum distance is about 6,000 feet. Average length of delivery required about 4,000 feet.

Direct line of discharge preferred, but consideration will be given to work being done in series or by relays.

Day and night operation required.

The plans and specifications will be ready on April 28th, 1913. Tenders for all or part of the work will be received up to 12 o'clock noon, May 28th. Work to commence August 1st, 1913.

Borings, plans and specifications, tender forms, etc., and general information relating to the work can be seen at the Engineering Department of the Commission, 76 Adelaide Street West.

Communications relative thereto to be addressed to E. L. Cousins, Chief Engineer.

All tenders to be sealed and addressed to A. C. Lewis, Secretary, Toronto Harbor Commissioners.

The Commissioners do not bind themselves to accept the lowest or any tender.

17-19 L. H. CLARKE, Chairman.

Enlargement of Aqueduct for Montreal Water Works

Direction of Public Works

Sealed tenders addressed to the Board of Commissioners of the City of Montreal, City Hall, and endorsed "Tender for Enlargement of Aqueduct," will be received at the office of the Board of Commissioners in the City of Montreal until twelve o'clock noon, on **Friday the 16th day of May next (1913)** for the works to be done for the enlargement of the City's Aqueduct, forebay and tail-race, by widening and deepening same on a length of about 31,000 feet.

The work comprises about 2,350,000 cubic yards of earth excavation and about 436,000 cubic yards of rock excavation. The transporting of the excess excavated material; the construction of reinforced and unreinforced concrete retaining sidewalls containing about 203,000 cubic yards of concrete, the construction of syphon culverts, etc., etc., the whole according to plans, cross-sections and specifications to be seen at and obtained from the office of the Superintendent of Water Works, Montreal.

Tenders must be made on blank forms to be obtained from the office of said superintendent and shall be sealed and filed no later than the hour above stated.

No tender will be entertained unless made upon the blank form above mentioned and unless accompanied by a certified cheque on a chartered bank of the Dominion of Canada and payable at the City of Montreal to the City Treasurer, for the sum of $200,000 (two hundred thousand dollars) which cheque shall be enclosed in the same envelope as the tender.

The tenders will be opened in the presence of the interested parties by the Board of Commissioners at a regular meeting held in their ordinary meeting room, at noon, on the 16th day of May, 1913.

Copies of the specifications and plans may be obtained from the office of the Superintendent of Water Works on payment of the sum of $20. To bona fide tenderers this amount will be refunded.

The Board of Commissioners reserve the right to reject the lowest or any tender.

By order of the Board of Commissioners.

L. N. SENECAL, Secretary.

Office of the Board of Commissioners,
City Hall, Montreal, April 9, 1913. 18

TOWN OF SIMCOE
PROVINCE OF ONTARIO

Sewerage Works

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on **Saturday, May 10th, 1913.**

Contract "P"—Sewage pumping station.
Contract "X"—Sewage disposal works.

Plans and specifications may be seen at the office of the engineers, Toronto, or at the Town Hall, Simcoe, Ont.

No tenders necessarily accepted.

L. C. GIBSON, Esq., Mayor.
W. C. McCALL, Town Clerk.
CHIPMAN & POWER, Engineers.
18-19

Concrete Bridges

Sealed tenders will be received up to 1.30 p.m. on **Tuesday, May 20th,** for the construction of seven reinforced concrete bridges and one concrete abutment for the County of Wellington.

For plans and other information apply to the undersigned.

BOWMAN & CONNOR,
Engineers.
D. ANDERSON, Esq.,
Fergus, Ont.
C. G. STICKNEY, Esq.,
19-20 Winfield, Ont.

CITY OF LACHINE

TENDERS

Sealed tenders will be received by the Corporation of the City of Lachine until the **12th day of May, 1913**, at 5 p.m., for the supply of materials required by the City, also for the installation of electric light in certain parts of the City, the construction of drainage and water works system.

For plans, quantities, specifications and other information apply to V. H. Dupont, 225 St. James street, Montreal, or at the City Clerk's office.

All tenders have to be made on special tendering form prepared by the City Engineer.

The Corporation does not bind itself to accept the lowest or any of the tenders.

Tenders to be addressed to the undersigned and endorsed for the kind of work or materials tendering.

HECTOR CHARETTE, City Clerk.
19 City of Lachine.

FOR SALE

Stone crusher, portable, with elevator. Also 16 h.p. gas engine, portable. Enquire Box 775, Contract Record, Toronto, Ont. 18-19

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

FOR SALE

Dredge and Derrick and Tug, Portable Crusher, and 20 horse power Boiler and Engine, 12-ton Case Roller, "steam steerer," 19 Dump Waggons, Wheel and Drag Scrapers, Shovels, Hammers and Picks. All in good working order and cheap. Apply to H. A. Camjaigne, Niagara House, Niagara Falls, Ont. 10-T.F.

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
C 1515 Rockefeller Bldg., Cleveland, O.

Yellow Pine Timber

We have on hand in London and Sarnia a quantity of Yellow Pine Timbers 8 x 14 to 12 x 14, 12 to 24 feet long. Prompt shipment can be made. For further particulars apply to The London Lumber Co., Ltd., London, Ont. 19-19

A large firm manufacturing carbon brushes for all kinds of service desires good electrical or supply firm or else good salesman to represent them in various parts of Canada. Apply Box 772, Contract Record & Engineering Review, Toronto, Ont. 18-19

Wanted

Large United States firm manufacturing the best carbolineum wood preserver on the market is considering the advisability of making an arrangement with some concern in Canada to handle their products on a royalty basis. For particulars address Box 784, Contract Record, Toronto, Ont. 18-19

Any concerns or individuals in building and construction business who desire to tender for contracts to architects, builders and owners write or enclose business card to Advertiser, who will introduce a protfiable proposition. This particularly applies to new firms and those seeking means of extending their business. Box 769, Contract Record, Toronto, Ont. 17-20

Get Our Booklet of SECOND-HAND MACHINERY

Steam Shovels, Locomotive Cranes, Rock Crushers, Trenching Machines, Hoisting Engines, Locomotives, Traction Engines, Dredges, Dump Cars, etc. WRITE TO-DAY

WILLIS SHAW MACHINERY CO.
39 So. La Salle St., Chicago, Ill. 19-T.F.

For Sale

Tenders wanted for purchase in whole or in part of the following apparatus:—

1 Goldie McCulloch Wheelock Engine 125 h.p. 20 x 50 x 16 x 50.
1 Laurie Corliss Engine, 90 h.p., 13 x 30.
2 [illegible] condensers and pumps, 8 x 12 x 12
36 ft. 4-in. line shafting, complete with vertical shaft hangers and boxes and 2 friction clutches.
2 belt tighteners.
1 pulley, 46 x 23.
1 pulley, 30 x 22.
2 pulleys, 19½ x 17
1 pulley, 17½ x 72
1 pulley, 5 x 28
79 ft. 2 ply, 17½-in. leather belt.
61 ft. 2 ply 16-in. leather belt.
82 ft. 19½-in. leather belt.
Approximately 100 ft. 4-in. steam pipe with valves and fittings complete.

All the above apparatus [illegible] but has been discarded owing to the introduction of Hydro Electric Power and [illegible] at thePumping Station, St. Marys' Ontario.

H. M. MILLER.
Sec. W. L. & H. Commission.
19-22 St. Marys, Ont

DO YOU NEED HELP?

If so let us know. We can furnish any amount of skilled and unskilled labor at shortest notice.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
Phone Adelaide 3919 19-21-23-25

Situations Wanted

Young engineer, technical graduate, wishes opening with good firm of contractors. Would take full charge of contract on salary and commission. Box 776, Contract Record, Toronto, Ont. 18-19

Situation Wanted.—General building foreman or superintendent. A.1. estimator and draughtsman. Have planing mill experience. Address Box 788, Contract Record, Toronto, Ont. 19

To Architects and Builders

Wanted, position as managing draughtsman or superintendent. Good Canadian experience and references. L. I. C. R. I. B. A., 295 Spadina Avenue, Toronto, Ont. ... ... .19

Miscellaneous

(Continued from page 73)

Ottawa, Ont.

Tenders will be received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, up to May 12th, for construction of single screw wooden tug with gasoline motor, 50 ft. 6 in. Plans, specifications, etc., at office of T. H. Schwitzer, Mech. Supt., Birks Bldg., Ottawa; A. E. Dubuc, Dist. Engr., Montreal; C. E. W. Dodwell, Dist. Engr., Halifax, N.S.; G. A. Bernasconi, Dist. Engr., North Sydney, N.S.; H. H. Donnelly, Supt. of Dredges, St. John, N.B.; J. T. Nickerson, Insp. of Dredges, Liverpool, N.S.; J. N. MacDonald, Insp. of Dredges, Charlottetown, P.E.I., and at Dept., Ottawa.

St. Mary's, Ont.

St. Mary's Cement Product Company, Water street. Manager, John J. Lind contemplate purchasing additional cement machinery at a cost of $25,000.

Swift Current, Sask.

The Corporation have awarded the following contracts: Gas well, The Northwest Drilling Company, Calgary, Alta.; steel water mains, gate valves and hydrants, The Drummond McCall & Company, Montreal; steam power plant, 3,300 h.p. water tube boilers, Babcock & Wilcox, Montreal; one 300 and one 500 high speed reciprocating steam engine, Goldie & McCulloch, Galt, Ont. One 200 and one 400 alternating current generators, Allis-Chalmers Bullock, Winnipeg, Man.

Business Notes

Brantford, Ont.

Core room and moulding shop of Pratt & Letchworth (Malleable Iron), Wilkins street burned. Loss estimated at $15,000 fully covered by insurance. To be rebuilt at once.

Cobalt, Ont.

Incinerator destroyed by fire. Clerk, R. L. O'Gorman. Loss $7,000.

Merritton, Ont.

Factory of Canadian Carbide Company burned. Electrical machinery damaged, loss $10,000

Preston, Ont.

Planing mill, owned by James Gillies, destroyed by fire. Will rebuild at once.

Roxton Falls, Que.

College,, owned by Marist Friars burned. Loss $15,000, insurance $4,500.

St. John, N.B.

Dry goods store, owned by F. W. Daniel & Company, Limited, Charlotte street, burned, loss $25,000. Insurance on building $27,000.

Toronto, Ont.

The Canada Foundry Co. will supply the structural steel for the new Loew Theatre on Victoria street.

New Companies

Kirby's Limited, have been incorporated, with a capital of $40,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are A. G. Robertson, financial agent, A. O. Boehmer, real estate broker, M. R. Edgar, accountant, all of Toronto.

Winchester Estates, Limited, Have been incorporated, with a capital of $150,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are J. J. Flint, bookkeeper, G. D. Waters and C. W. O. Goshorn, cashiers, all of Toronto.

The Great Lakes Investments, Limited, have been incorporated, with a capital of $250,000, to carry on business as construction contractors, with head office at Fort William. The provisional directors are E. P. Clement, E. W. Clement, and W. P. Clement, barristers, all of Berlin.

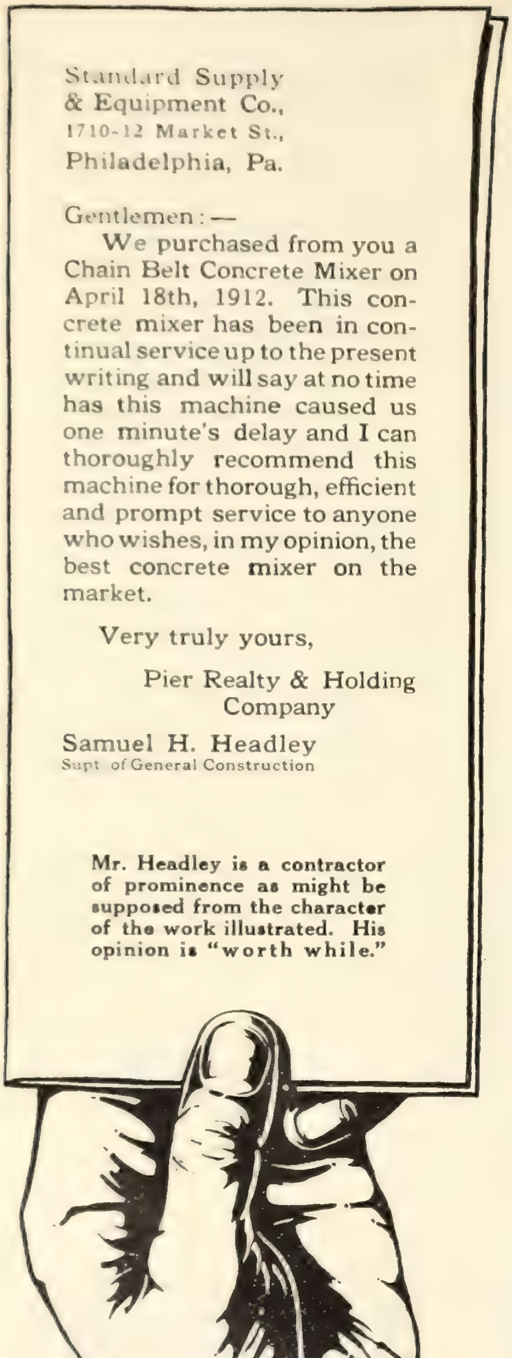
The Zorra Telephone Company, Limited, has been incorporated, with a capital of $6,000, to carry on the general business of a telephone company, with head office at Embro, Ont. The provisional directors are G. A. Munroe, Jas. Crang, farmers, of the township of West Zorra, and Dr. R. H. Green, of Embro, Ont.

For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where the [illegible] full of ozone breathing health will put new life in tired and busy. Muskoka offers more real healthful enjoyment for less money than any other resort in the World.

Four cottages to rent [illegible] Bohemia Island [illegible] Royal Muskoka Hotel and good Golf Links. Box [illegible]

Contract Record, Toronto Ont.



Standard Supply
& Equipment Co.,
1710-12 Market St.,
Philadelphia, Pa.

Gentlemen: —

We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding Company

Samuel H. Headley
Supt of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

MILWAUKEE, WISCONSIN

**Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.**

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

High Grade Contractor's Plant

STEAM SHOVELS—2 Bucyrus 70-C. Shop Nos. 1446 and 1520. New in April and November, 1912.
3 Marion Model 60. Shop Nos. 2110, 2358 and 2361. New 1910 and 1911.

LOCOMOTIVES 36 INCH GAUGE—18 Porter 10x16 inch 18 ton four wheel, saddle tanks-steam brakes. New 1911 and 1912.

DUMP CARS, 36 INCH GAUGE—180 K. and J., Western and Koppel, 4 yd. 2 way. New in 1911 and 1912.

LOCOMOTIVE CRANE—1 Brown Hoist, 15 ton, 8 wheel, 2 drums, standard gauge with 44 ft. 6 inch boom, with outriggers. New 1911.

AIR COMPRESSORS—3 Ingersoll-Rand Imperial Corliss XC-3 class, 18x30x28x17x24 inch, capacity 2381 cubic *ft.* of free air per minute. As good as new.

Send for List No. 53 Which Includes

AIR REHEATERS
AFTERCOOLERS
AIR SEPARATORS
BELT CONVEYOR
BLOWERS
BOILERS
BUCKETS
CARS
CONCRETE MIXERS
CONDENSERS
DERRICKS
DRILLS
DRILL SHARPENERS
ELECTRICAL EQUIPMENT
FLOATING EQUIPMENT
HOISTING ENGINES
PIPE
PUMPS
RAILS
WELL DRILLS

E. C. Sherwood, Hudson Terminal Bldg., New York City

19-20

IF you want a subsitute for plaster and laths which is a FINISHED product—not a makeshift—talk with us or write for free samples of

NEPONSET
WALL BOARD
for Walls and Ceilings

This tough fibre board is entirely different than other wall boards and similar materials. It is waterproofed and it is FINISHED.

BIRD & SON

(F. W. Bird & Son)

MILLS:
Hamilton, Ont., and Pont Rouge, Que.

MAIN OFFICE:
Hamilton, Ontario

Winnipeg, Man. **St. John, N.B.** **Montreal, Que.**

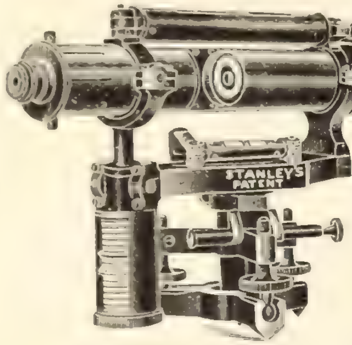
Note tremendous metal weight on this floor. Entire building of Alsen's Cement reinforced concrete.

Alsen's Cement

was selected in 1905 for the Panama Canal in preference at equal prices and has exceeded those severe requirements. Sold under a guarantee other Portlands cannot make in good faith. Other brands have been supplied only on modified specifications.

Alsen's American Portland Cement Works
45 BROADWAY, NEW YORK

TRADE STANLEY MARK



Stanley's Gradiometer saves much time in Railway and Drainage Works. Can be divided to read either ordinary or percentage gradients. Illustrated phamphlet on application.

The Largest Manufacturers of Surveying and Drawing Instruments in the World.

Drawing Office Stationery of all kinds supplied on the most favorable terms. A very large stock kept.

Please send for our catalogue "K 91" and compare our prices with those of other *first-class* makers.

We were awarded four Grand Prix and a Gold Medal at the Turin Exhibition, 1911.

W. F. Stanley & Co., Limited
Great Turnstile, Holborn, LONDON, ENGLAND

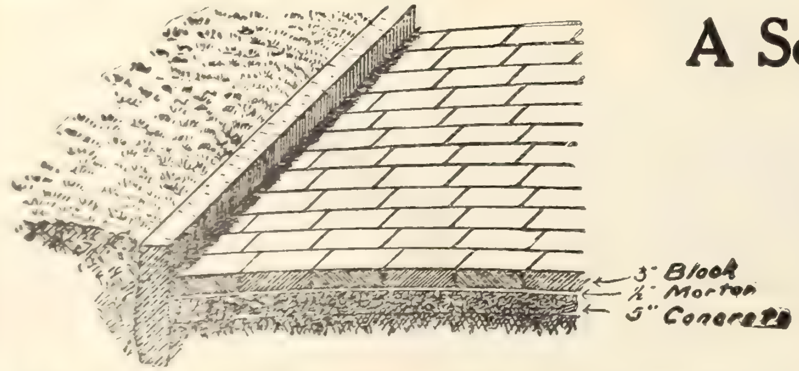
"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL



A Scientific Pavement

must be

Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and Easily Cleaned.

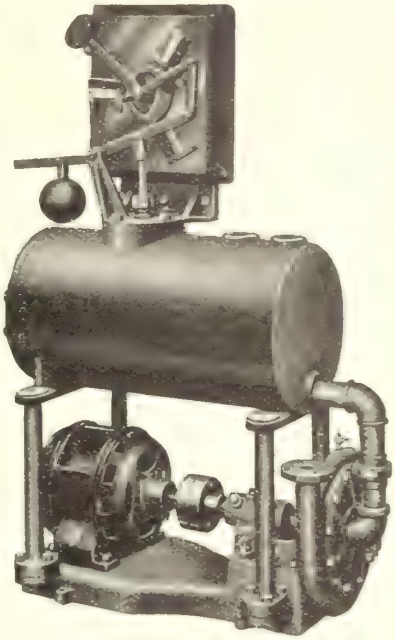
These requirements are met by
Asphalt Block Pavements
Send for Descriptive Literature

The Ontario Asphalt Block Company, Limited - Windsor, Ont.

CENTRIFUGAL PUMPS

to take care of the

Water Condensation

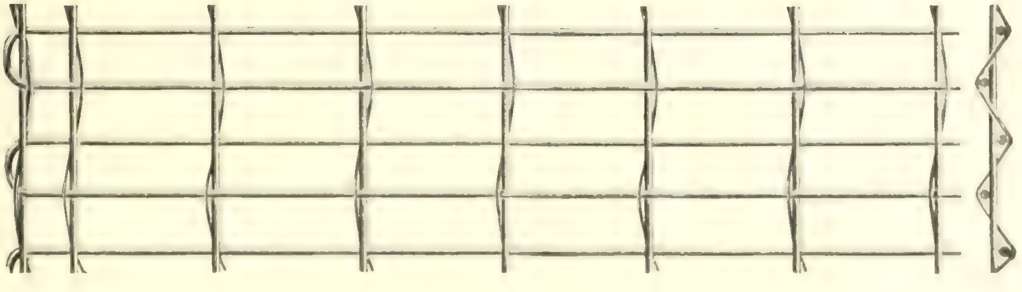


We show here a simple and effective means of draining steam jackets, heating systems, steam coils, drying cylinders, etc. The condensed steam is led to the inlet at the top of the receiver and falls to the bottom. The water in rising lifts a float switch and the motor starts and stops the pump automatically. This arrangement obviates the use of steam traps or tanks and, in addition, automatically returns to the boiler all water of condensation.

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL. Sales Offices: MONTREAL, TORONTO, COBALT, WINNIPEG, CALGARY, VANCOUVER.
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

Greening's Patent Trussed Wire Lath



Easily applied. The best, cheapest and most satisfactory on the market.

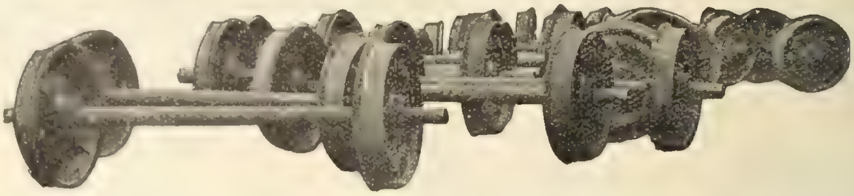
Write for particulars and price

WIRE ROPE **WIRE REINFORCING**

MANUFACTURED BY

The B. Greening Wire Co. Limited

Hamilton, Ont. **Montreal, Que.**



RAILWAY CONSTRUCTION PLANT

Hoisting Engines, Horse Powers, Hand Winches, Derricks, Car Wheels, Axles and Boxes, Dump Cars, Rail Cars, Buckets

MARSH & HENTHORN, Limited

Makers of Hoisting Machinery BELLEVILLE, ONT.

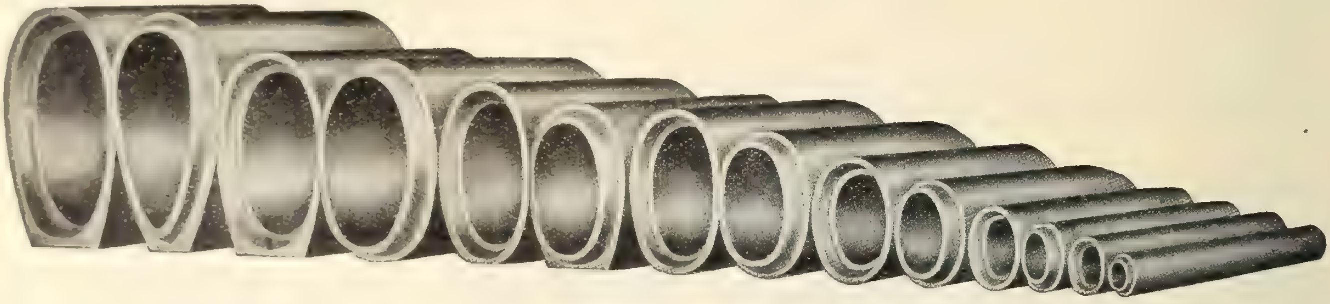
Send for Catalog

SALES AGENTS

MUSSENS

LIMITED

Montreal, Que.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario

EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

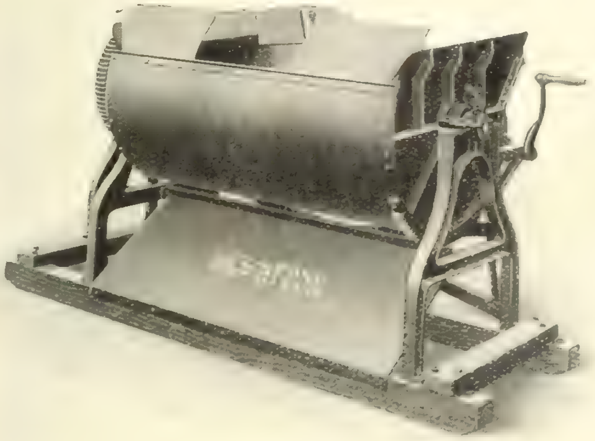
The Galt Stove & Furnace Co., Limited

Galt, Ontario, Can.

Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square

Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

Time Saved in Concrete Mixing



The Blystone Skid Mixer

Every movement of this mixer is calculated to save time. The mixing is quick and thorough and the dumping, worked by the handle on the right will save moments at every batch turned out. Strongly built—all working parts carefully balanced.

The Blystone Machinery Company
63 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
Contractors Department No. 1, TORONTO, CAN.
Sole Distributors for Canada

"HALITUS" Ventilators

Highly
Efficient

Inexpensive

Sizes
6 to 96 inch
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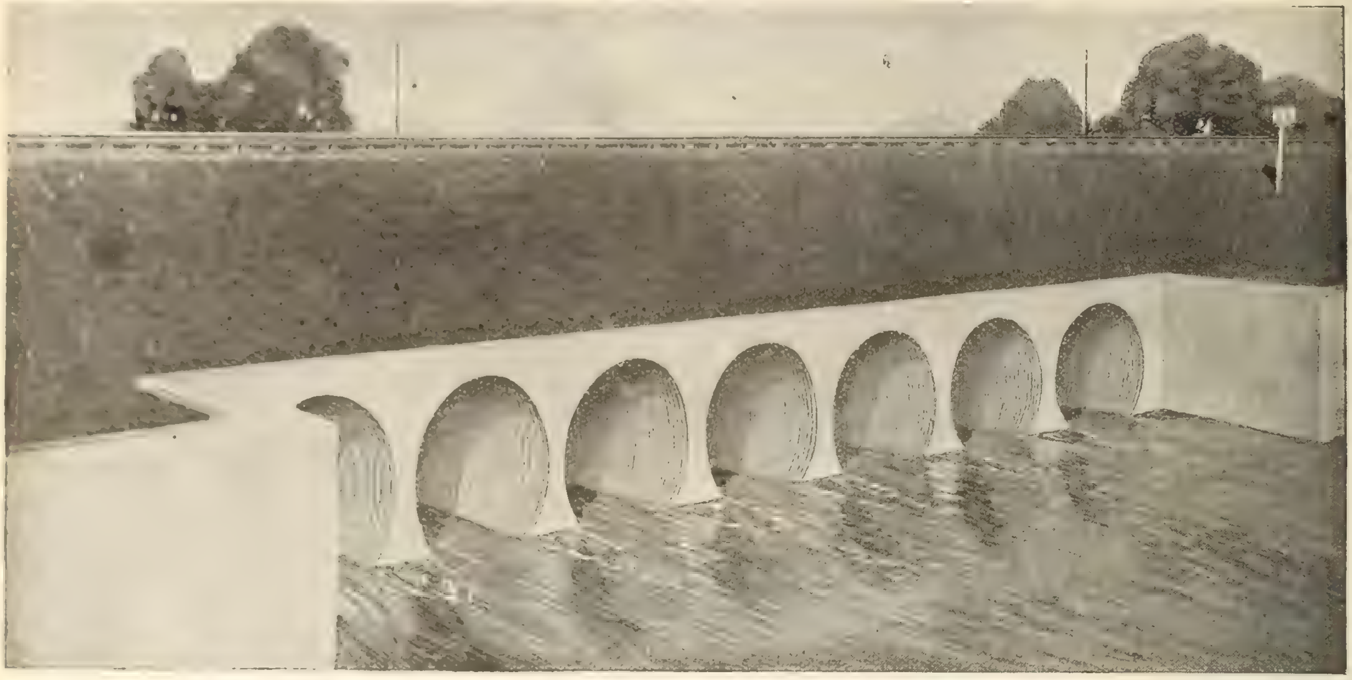

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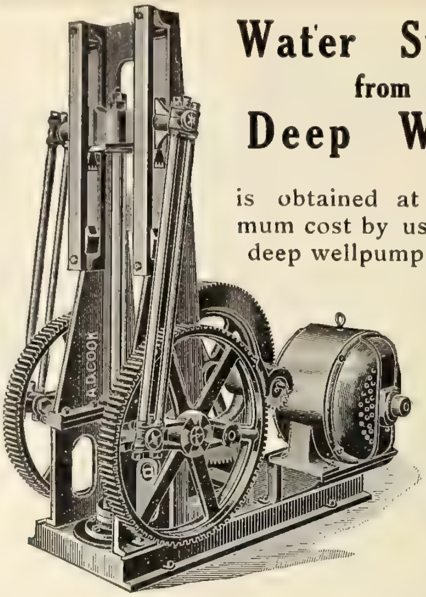

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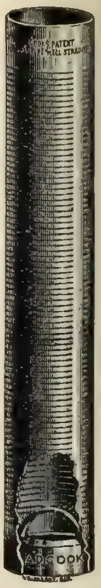

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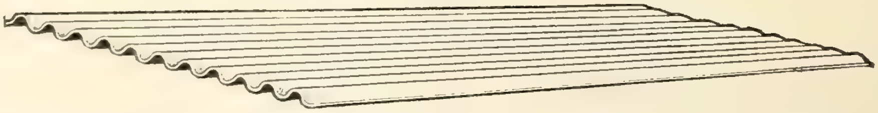

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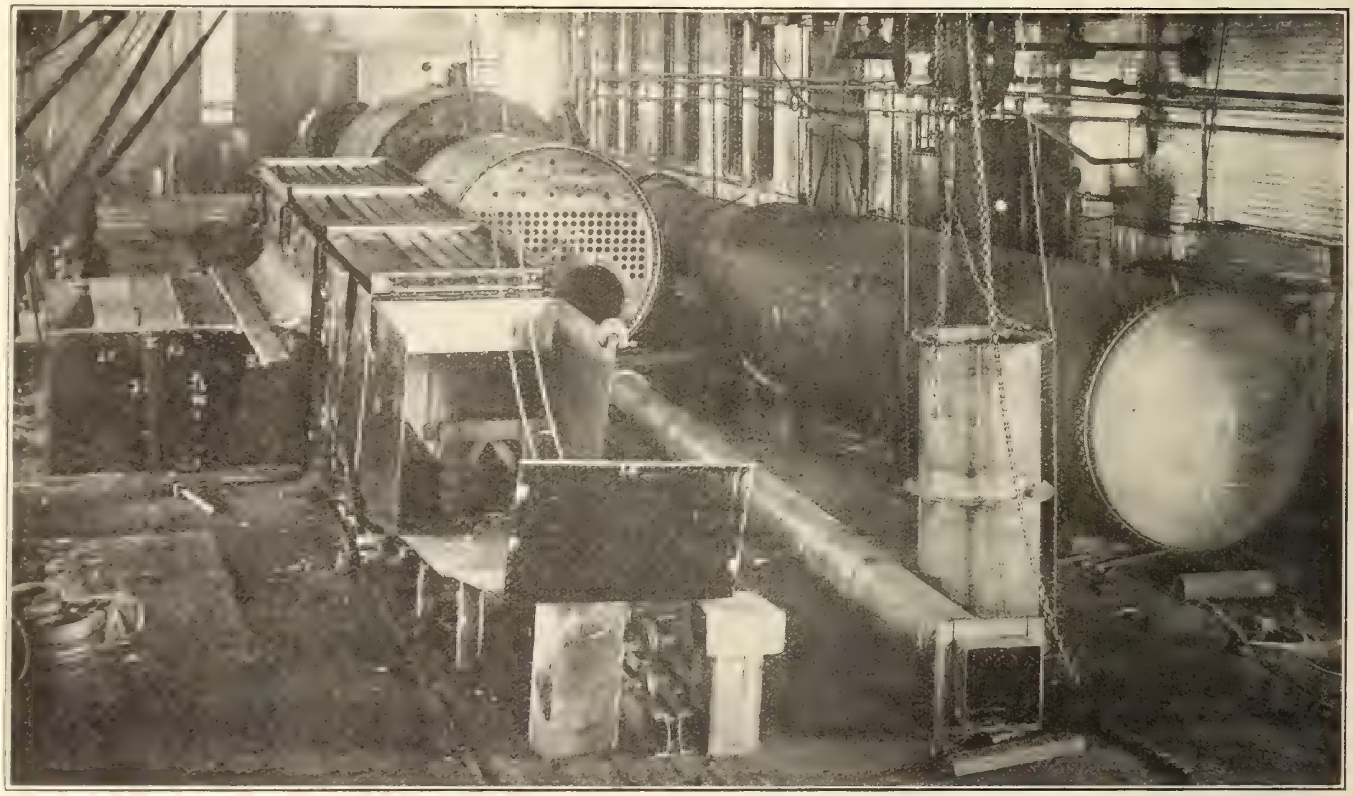

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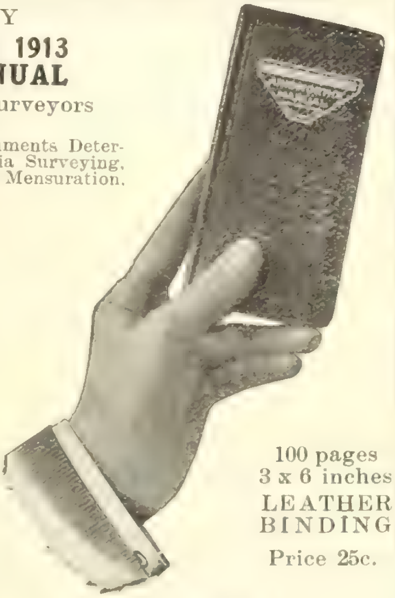

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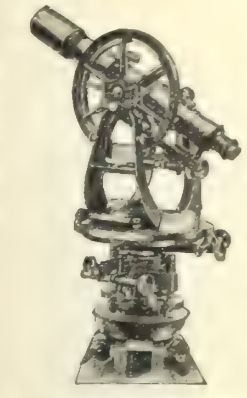

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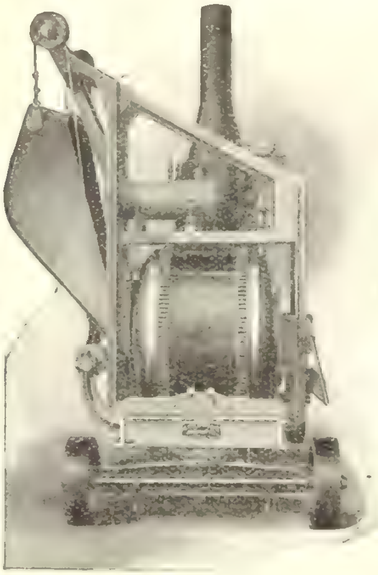

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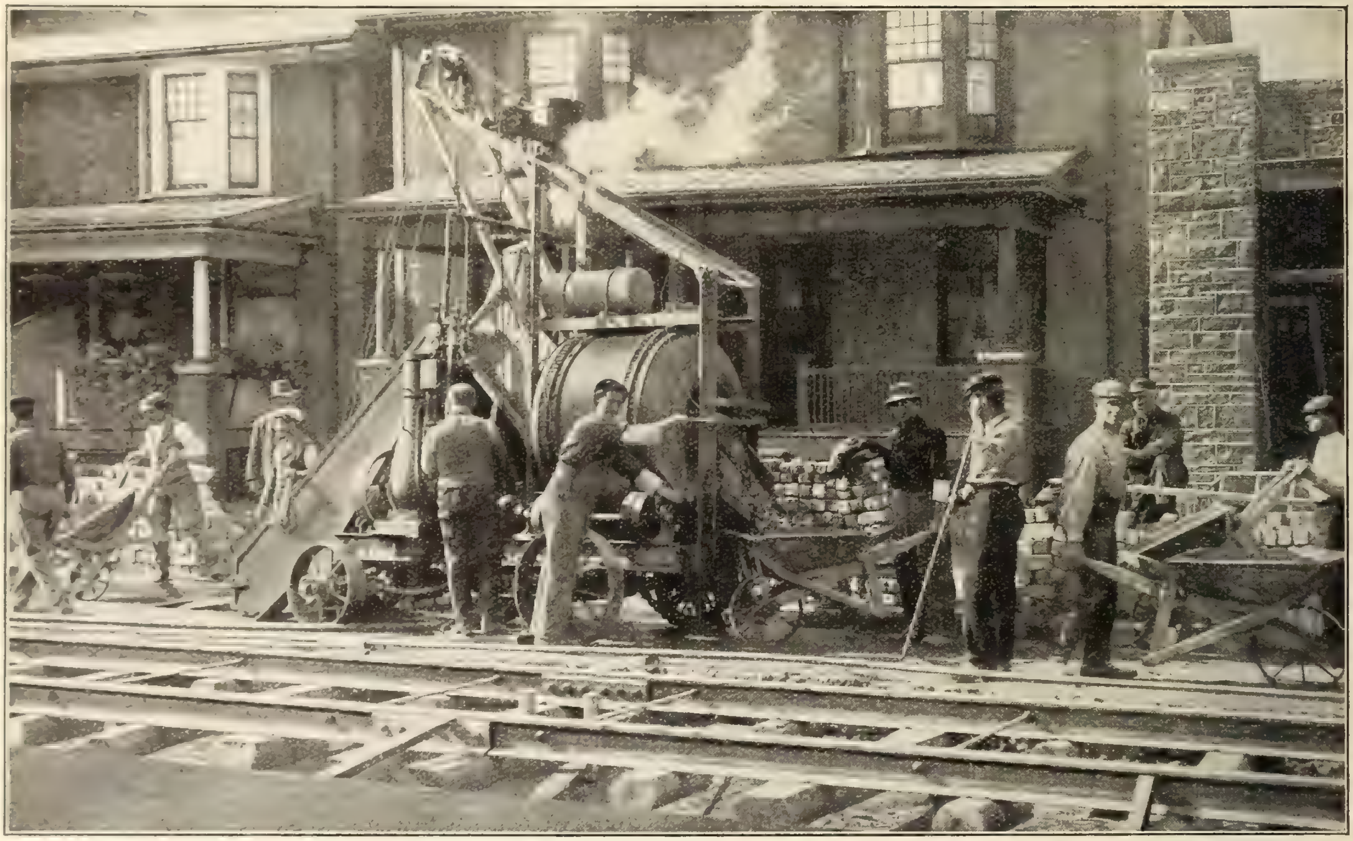

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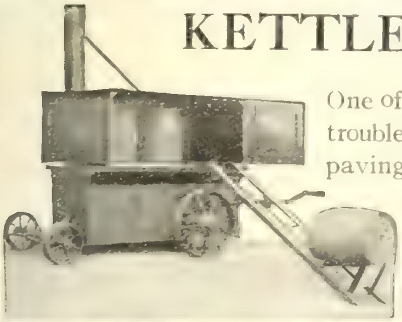

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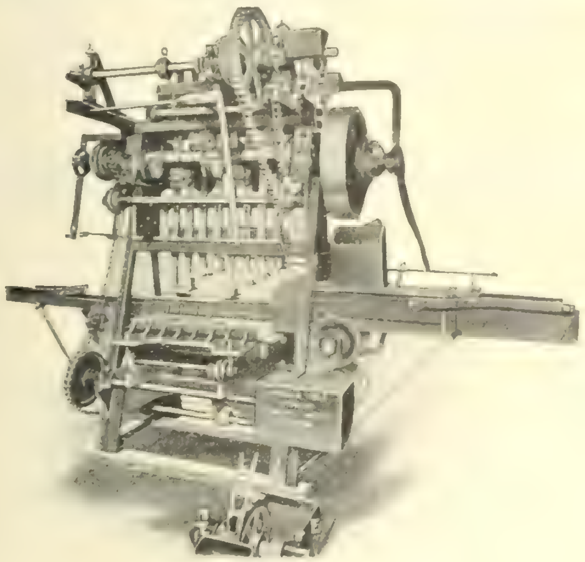

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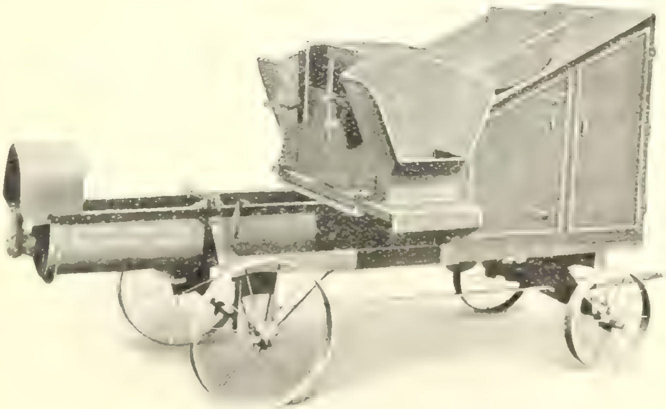

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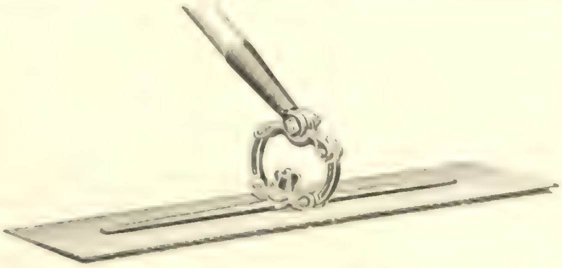

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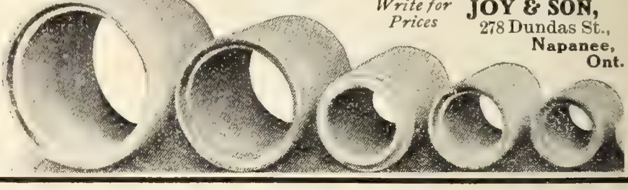

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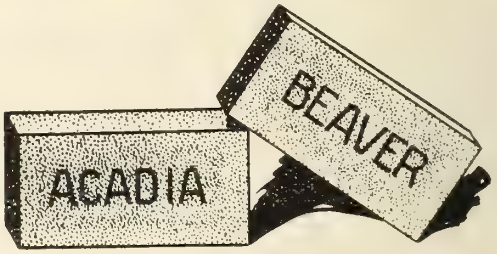

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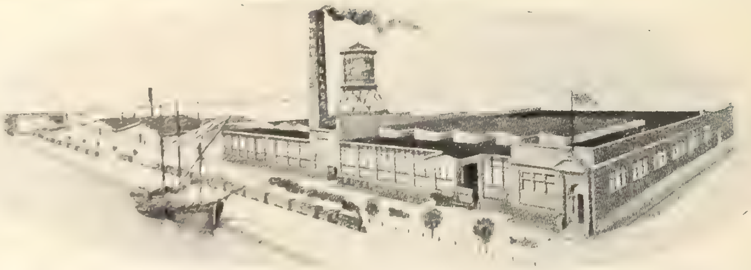

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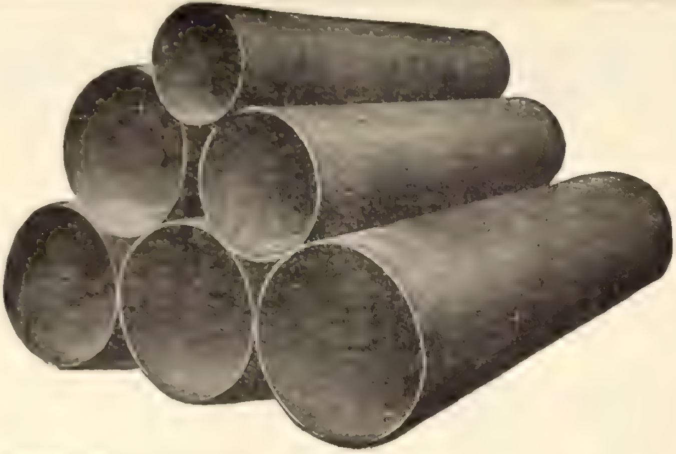

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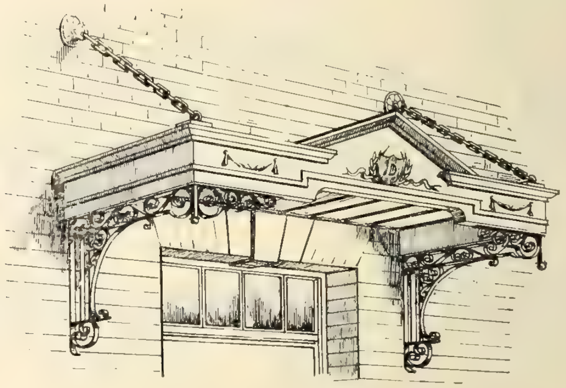

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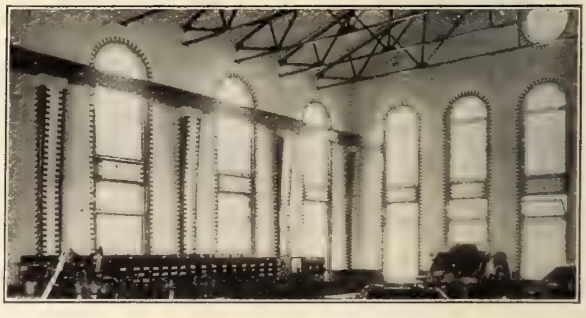

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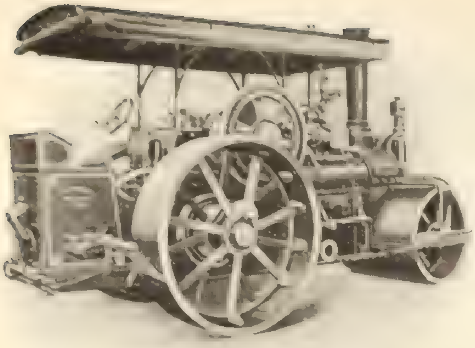

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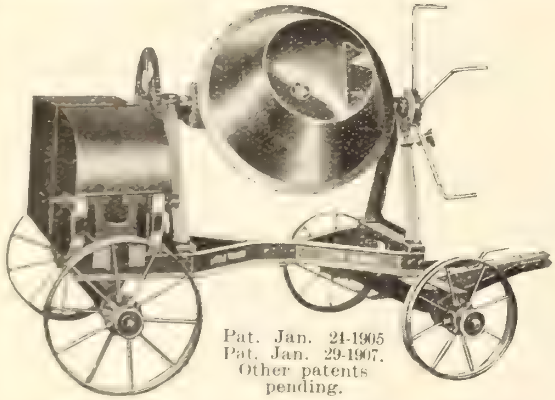

Pat. Jan. 24-1905
Pat. Jan. 29-1907.
Other patents pending.

You're the Man

that needs this mixer if you're wise to profits—the mixer that made big profits for hundreds of contractors in the States last year—that pays for itself in less than 20 days—that is sold under a "Man to Man" proposition of TEN DAYS' FREE TRIAL (and even this yields a profit)—a mixer that does the work of machines for which you'd pay three times the price—that is absolutely unapproached in profit making capacity by any mixer of similar size in the world.

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"THE SMALL JOB MONEY-MAKER"

Mixes 25 to 35 Cu. Yds. per day at only one cent per Cu. Yd. for gasoline. The original small Tilting Drum Batch Mixer. Charges on one side, discharges on the other. No clogging or choking. Saves $12 per day over hand mixing, also the hard work and does it better.

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Mixes 60 to 90 cu. yds. per day—with Side Loader 120. A 1/3 yd. "sack to the batch." Does the work of heavy, old style mixers with half the initial investment.

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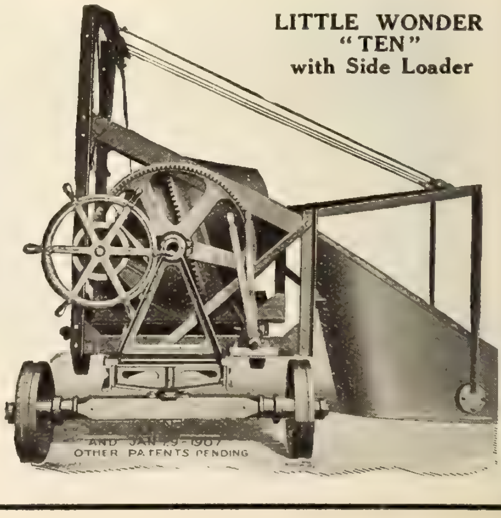

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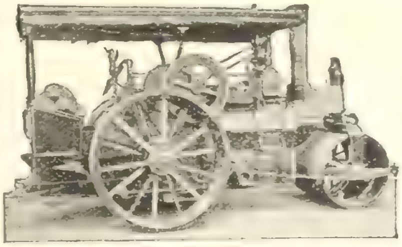

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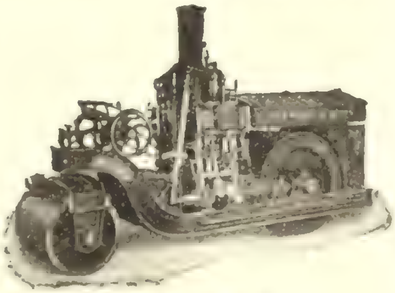

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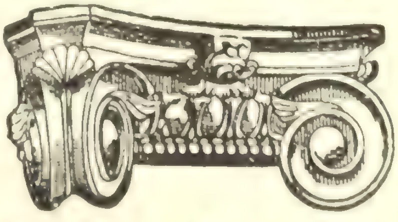

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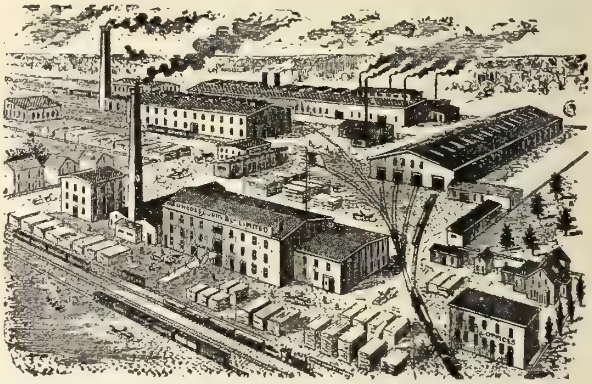

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3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

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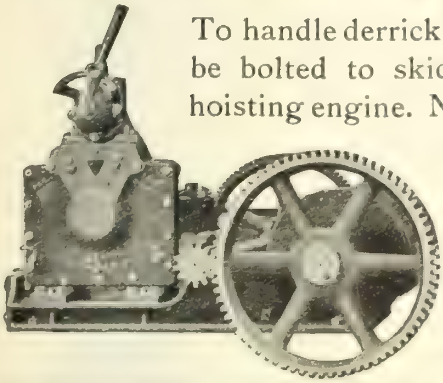

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With our 9 Branch yards situated as they are we are prepared to guarantee a prompt delivery service of any orders you may favor us with and would ask you to give us a trial in order that we might prove same to you and also prove the excellence of our material.

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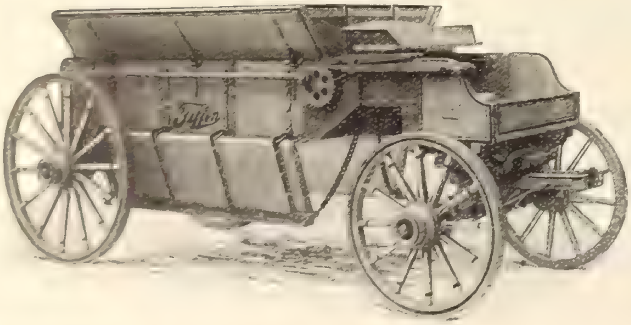

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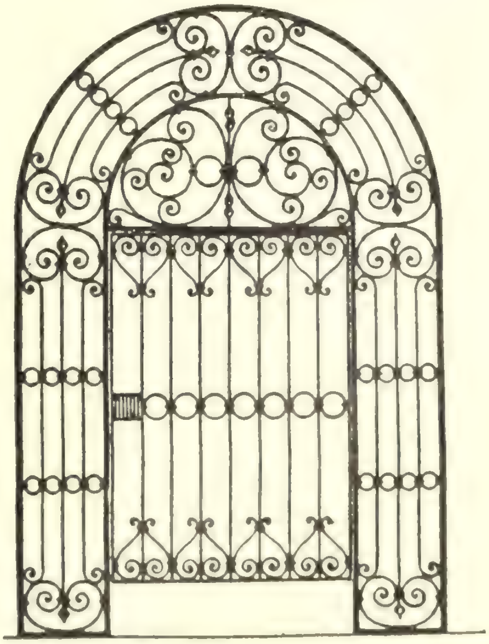

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[illegible] delivered at [illegible]

	Per M
No. 1 [illegible] brick	$18 00
No. 1 [illegible] brick	18 00
Red Stock Bricks	13 00
[illegible] Stock [illegible]	13 00
Wire cut bricks for foundation work ...	12 00
[illegible] bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft. ...	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking ...	24 00	27 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide [illegible]	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving—	36 00	40 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	27 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 75
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	25
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 in	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51 60	4 75	7 00
61 70		8 00
71/80		9 00
81/85		10 00
86 90		11 00
91 95		13 00
96 100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

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Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 60 per cent.

Lead Pipe

Lead pipe, $7.50 net, less 10 per cent.; lead waste, $9.00 net, less 10 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 30 per cent.; pig lead, 6½c. lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.04	¼ inch	$2.86
⅜ "	2.04	⅜ "	2.86
½ "	2.72	½ "	3.57
¾ "	3.16	¾ "	4.31
1 "	4.54	1 "	6.19
1¼ "	6.19	1¼ "	8.44
1½ "	7.43	1½ "	10.13
2 "	9.90	2 "	13.50
2½ "	15.80	2½ "	21.56
3 "	20.75	3 "	28.31

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a yard, f.o.b. Toronto siding.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

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Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 61c. per gal. of 9 lbs.

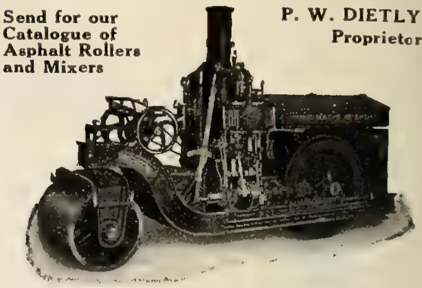
Raw Linseed Oil, in bbls., 58c. per gal. of 9 lbs.

Turpentine, in barrels, 66c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.



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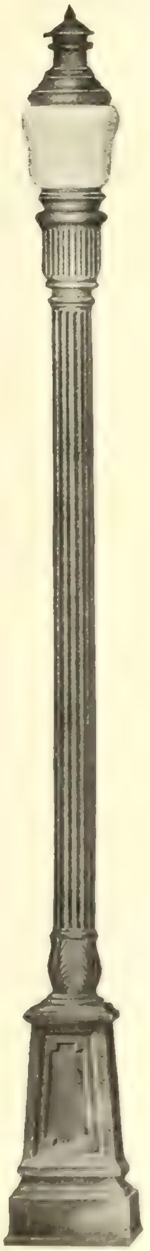

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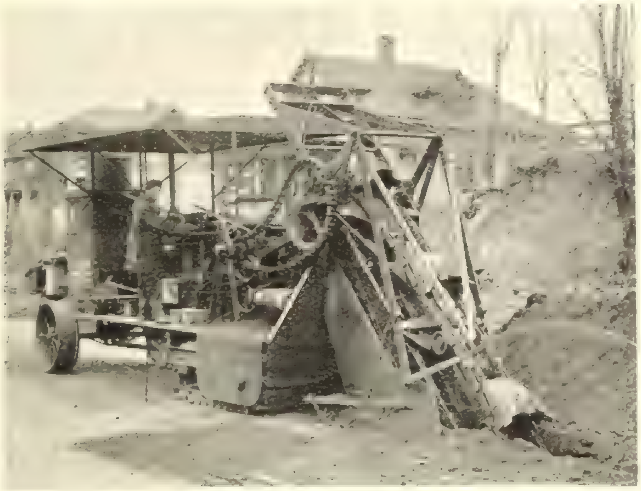

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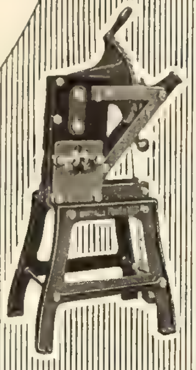

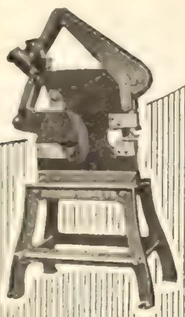

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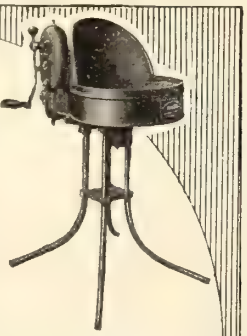

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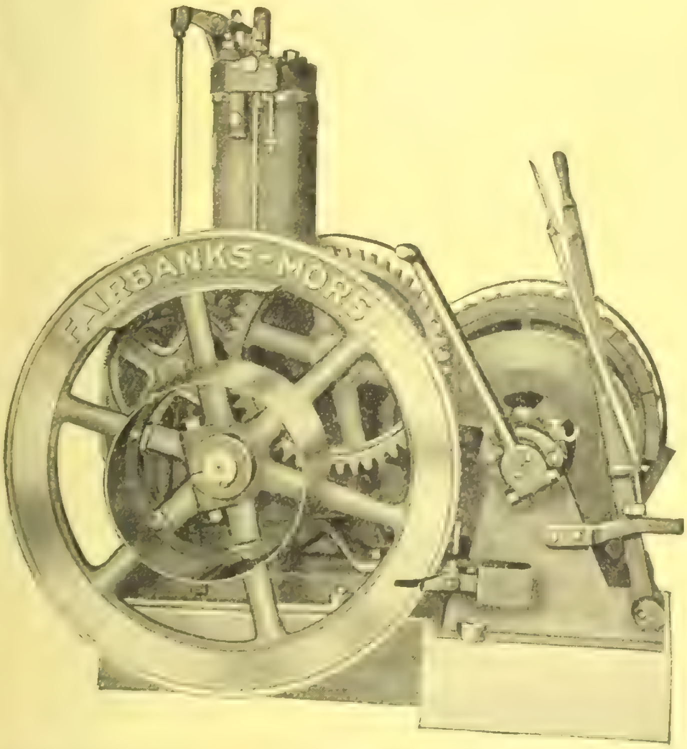

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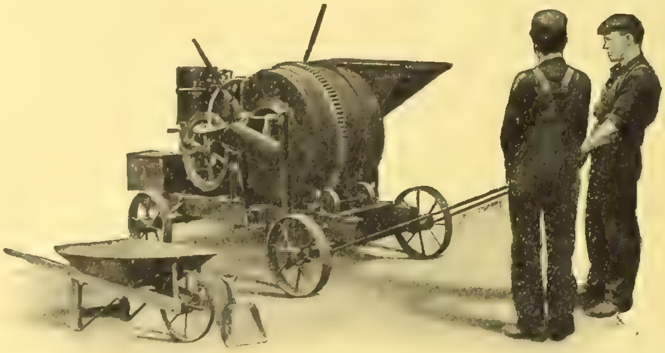

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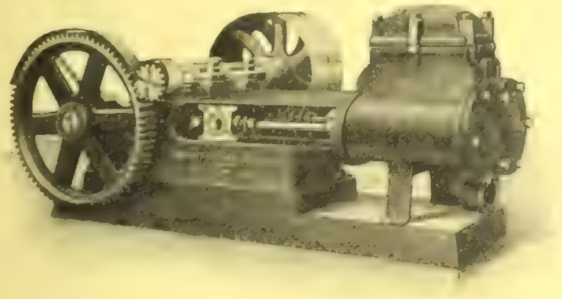

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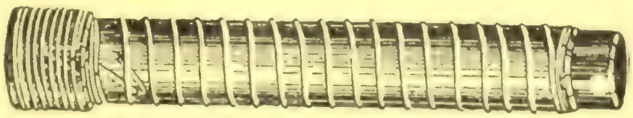

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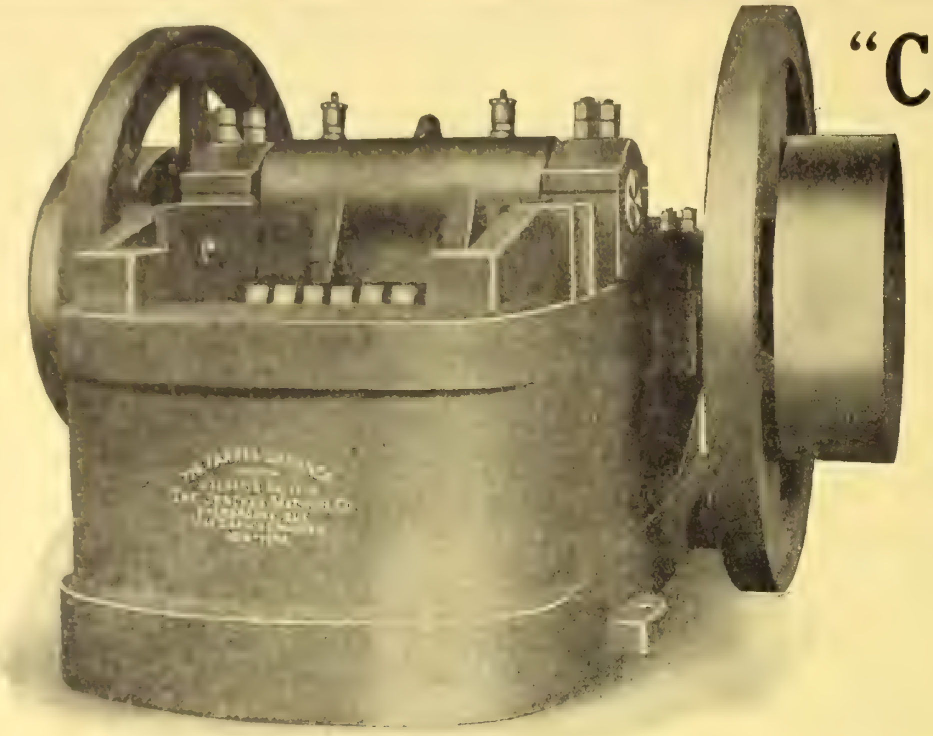

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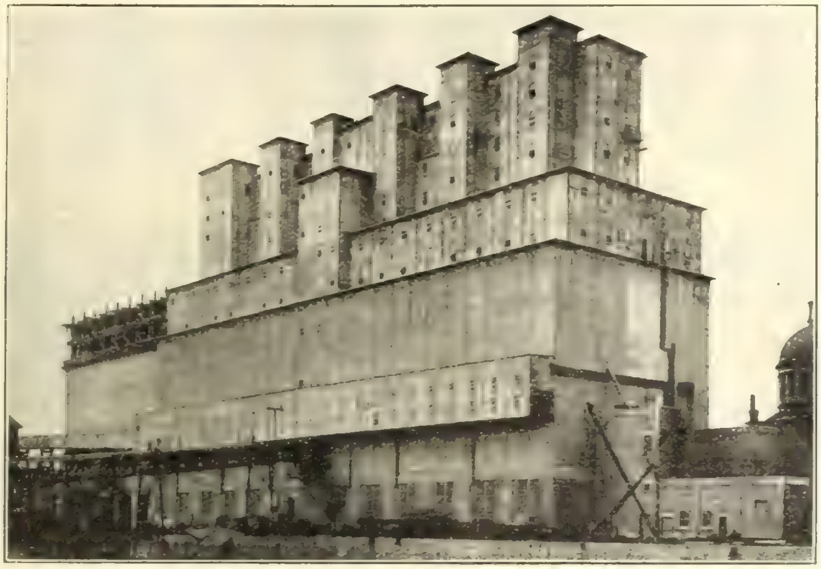

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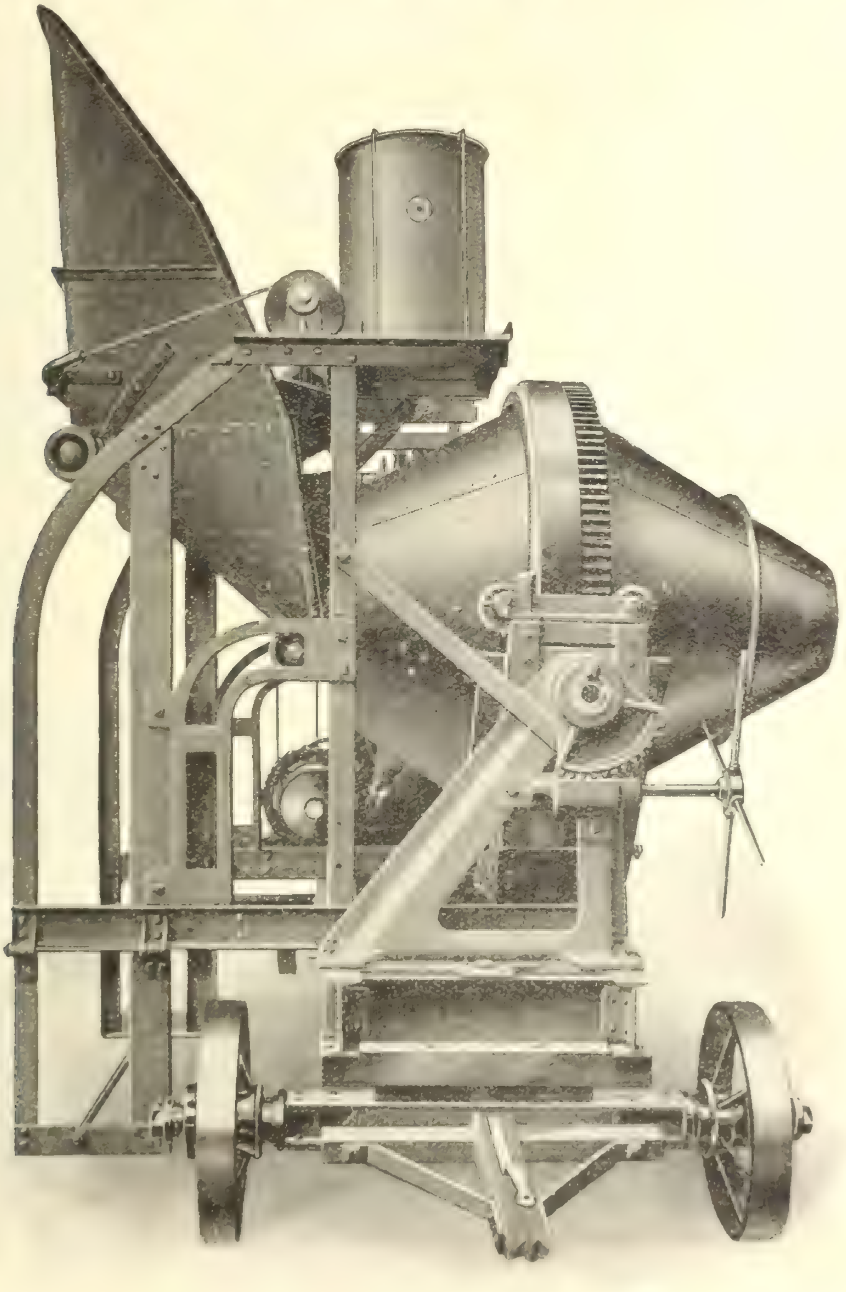

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Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Furnaces (Special)
Improved Equipment Co.

Gasoline Engines
Wettlaufer Bros.

Gas Plants Complete
Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

Glass
Consolidated Glass Co.
Hobbs Mfg. Co.
Luxfer Prism Co.
Toronto Plate Glass Imp't'g. Co

Hammer Drills
Canadian Ingersoll-Rand Co.

Heating Apparatus
Canadian Buffalo Forge Co.
Canadian Sirocco Co.
Sheldons Limited

High Pressure Pipe Lines
Canadian Boving Co.
Escher Wyss & Co.

Hoisting Apparatus
American Hoist & Derrick Co.
Beatty & Sons, M.
Browning Engineering Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Doty Marine Engine & Boiler Co
Jenckes Machine Co.
Hopkins & Co., F. H.
Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F.

Hoisting Engines
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

Don Valley Clay Products

For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Lumsden Building, Toronto

J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.

Don Valley Fireproofing, Bricks and Tile used throughout.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Traders Bank, Toronto

Carrere & Hastings and F. S. Baker, Associate Architects.

Don Valley Porous Terra Cotta Fireproofing and 2,0000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Royal Bank, Toronto

Eustace G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

Bell Telephone Building

Adelaide Street, Toronto

W. J. Carmichael, Architect. Wickett, Limited, Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

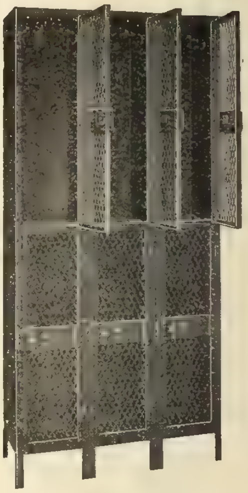
TORONTO - ONTARIO

"STEELCRETE" STEEL LOCKERS **"STEELCRETE" STEEL LOCKERS**

Locker Advantages

Wherever personal possessions must be left in the keeping of strangers, lockers provide the only really satisfactory arrangement of ensuring the safety of goods and the comfort of the possessor.

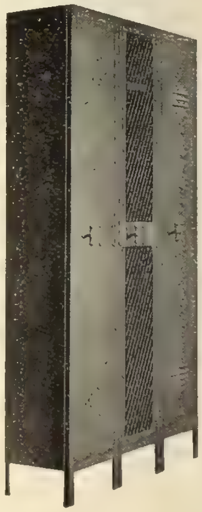
In waiting-rooms, dressing-rooms, cloak rooms, etc., lockers relieve those in authority of all responsibility of loss or damage and thereby form a permanent insurance against the many claims on property left in their charge.



"Steelcrete" Steel Lockers

form a new type of safety lockers carefully thought out and designed and containing many advantages over the usual class of metal cage hitherto in use. These lockers are made all steel and are particularly suitable for

Warehouses, Gymnasiums, Schools, Clubs, Banks, Hospitals, Police Stations, Armouries, &c.



Steelcrete Steel Lockers are finished in olive green enamel and are exceptionally **neat** in appearance, **clean and sanitary,** and **solid** as a block of wood. They are constructed throughout of the finest high-grade steel and are unequalled for their Strength and Rigidity.

The Standard Sizes and fittings, etc., are carefully calculated to meet every ordinary requirement.

Made in "Single Tier" or "Double Tier" with sheet steel or expanded metal (open mesh) doors—combination locks or padlocks instead of rim locks if desired.

Write to Us—Our Prices will Interest You

STEEL and RADIATION

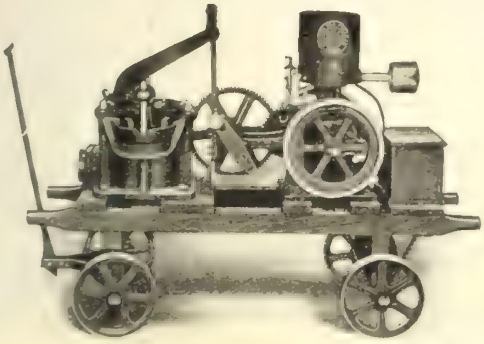
LIMITED

Toronto, Canada

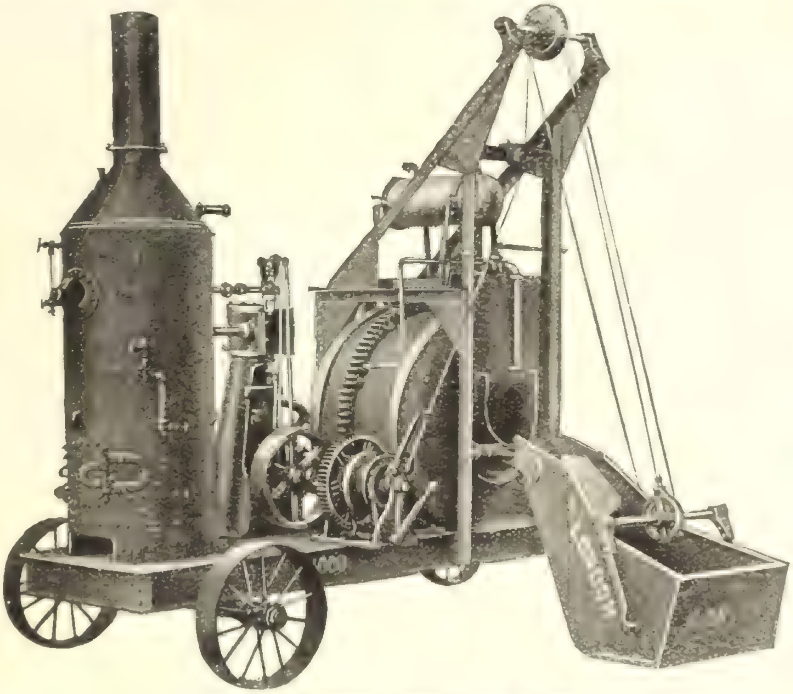
"STEELCRETE" STEEL LOCKERS **"STEELCRETE" STEEL LOCKERS**

Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.

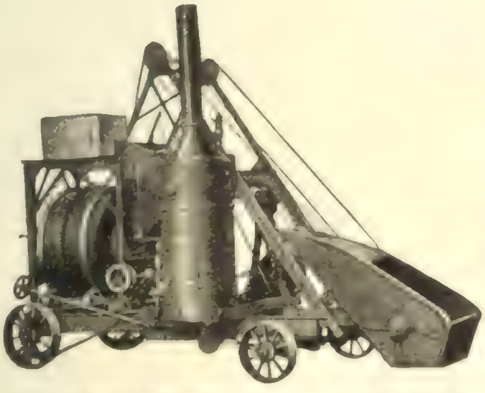


Power Diaphram Pump



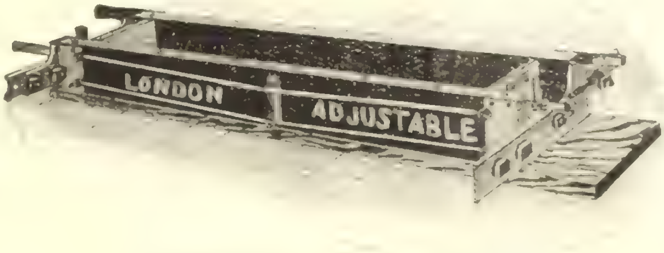
London Standard Drum Batch Mixer
This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.

We are the largest manufacturers of Concrete Machinery in Canada.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.



London Sill Step and Window Cap Mould

A few lines we manufacture

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

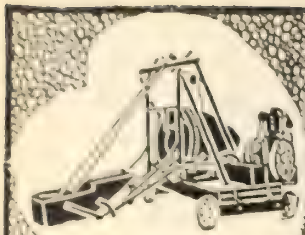
Cabell St. and Kitchener Ave., LONDON, ONT.

BRANCHES:

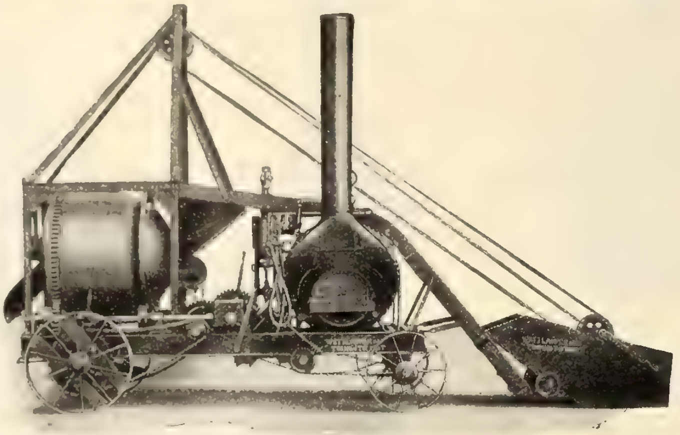
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
HALIFAX (106 Pleasant St.) G. B. Oland, Mgr.

AGENCIES:

VANCOUVER, B. C. Equipment Co. MOOSE JAW, SASK., Bridge & Iron Co., Ltd. REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co.



Wettlaufer Bro's IMPROVED CONCRETE & ROAD MACHINERY



Send for Illustrated Catalogue giving full description of this Mixer.

The Wettlaufer Story

No. 3

Some mixers will stand just so much and then give up—just so many days of steady hard wear and then break down. That's any man's luck, but for genuine downright exasperation give me the mixer that runs an hour and then stops of its own accord for a tap of the hammer or a turn of the wrench. There's lots of that sort around—they'll run a piece and then stop—keep the gang waiting doing nothing till they can be coaxed to go on.

No siree—nothing like that about my equipment—not since I had my Wettlaufer Heartshape Mixer.

Wettlaufer Heartshape Mixers

will give the highest satisfaction in every day, all day work.

See the new Wettlaufer Heartshape Stationary Drum Traction Mixer with Horizontal Boiler. There are more points of advantage in this Mixer than in any other mixer on the Market.

Come and see it working—Continuous Demonstrations at

Wettlaufer Brothers

178 Spadina, Ave., Toronto, Ont.

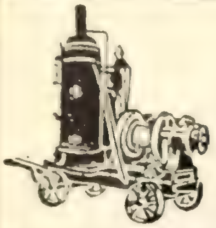
Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

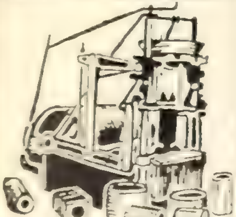
A. E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria. B. C. A. R. Williams Machinery Co., 15 Dock St., St. John, N. B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R. F. Mancill, 405 Cadogan Blk., Cal. The Hallman Machinery Co., 3743 Alexander St. Vancouver, B. C. J. L. Lachampe, 363 St. Paul St., Quebec.

Montreal Office and Warerooms: 316 Lagauchetiere St. W.

MIXERS

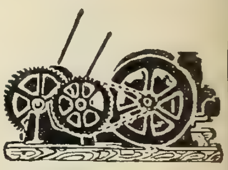


TILE MACHINES

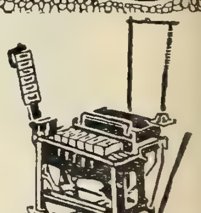


CRUSHERS

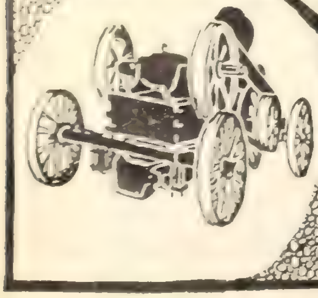
HOISTS



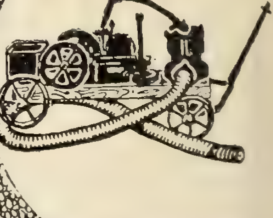
BRICK MACHINES



PUMPS



THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS



Orleans Filtration Plant and Concrete Building taking about 100,000 barrels of Alsen's New Cement

Alsen's Cement

was selected in 1905 for the Panama Canal in preference at equal prices and has exceeded those severe requirements. Sold under a guarantee other Portlands cannot make in good faith. Other brands have been supplied only on modified specifications.

Alsen's American Portland Cement Works
45 BROADWAY, NEW YORK

THE Underwood embodies in one machine all that can be expected in a typewriter. It is sold at the price which should be paid for a machine of its quality.

United Typewriter Co., Ltd.
All Canadian Cities

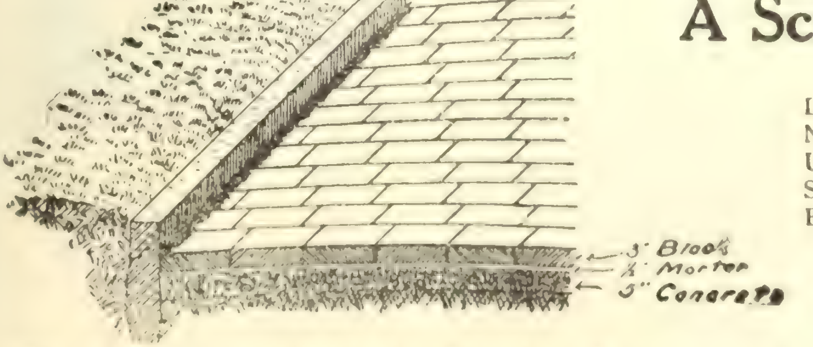
"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL



A Scientific Pavement

must be

Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and Easily Cleaned.

These requirements are met by
Asphalt Block Pavements
Send for Descriptive Literature

The Ontario Asphalt Block Company, Limited - Windsor, Ont.

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Ice-making Machinery
Linde British Refrigeration Co.

Insulating Compounds
Canadian Mineral Rubber Co.
Standard Underground Cable Co. of Canada, Limited

Interior Finish and Doors
[illegible]
Canada Office & School Fur. Co.
Rhodes Curry & Co.

Kilns
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Co.
Berg Machinery Mfg. Co.

Lime
Jamieson Lime Co.
Ontario Lime Association.

Lime Kilns
Improved Equipment Co.

Locomotives
Buffalo Pitts Co.
Canadian Boving Co.
Montreal Locomotive Works
Canada Foundry Co.
F. H. Hopkins Co.
Mussens Limited.

Marble
Dominion Marble Co.
Missisquoi Marble Co.

Metal Lath
Greening Wire Co., B.
Metallic Roofing Co.
Noble, C. W.
Steel & Radiation Ltd.

Meters, Electrical
Ferranti Electrical Mfg. Co.
Can. General Eectric Co.

Meters, Water
Hopkins & Co., F. H.
McDougall Caledonian Iron Wks
Neptune Meter Co.

Motor Trucks
Jones & Glassco

Paints (Bridge and Structural Iron and Pipe Coating)
Canadian Mineral Rubber Co.
Dominion Paint Works.
Goheen Mfg. Co.

Paints and Varnishes
Dominion Paint Works.
Goheen Mfg. Co.
Pinchin, Johnson & Co.

Paving Cement
Canadian Mineral Rubber Co.

Paving and Paving Materials
Dominion Creosoting Company.
Ontario Asphalt Block Co.
Paterson Mfg. Co., B.
Asphalt & Supply Co.
Barber Asphalt Paving Co.

Perforated Metals
Canada Wire & Iron Goods Co.
Greening Wire Co., B.

Pipe (Concrete, Iron and Wood)
American Spiral Pipe Works.
Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Pedlar People.
Piggott & Co., Thos.

Pile Driving Machinery
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.

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Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Plaster
Alabastine Company.
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

Plug Drillers
Canadian Ingersoll-Rand Co.

Plumbers' Supplies
Standard Ideal Company .

Pneumatic Machinery
Canadian Ingersoll-Rand Co.

Portable Saws
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

Power Engines
Inglis Company, John.
Jenckes Machine Company.
Canada Foundry Company.
Waterous Engine Works.

Pumps and Pumping Machinery
Beatty & Sons, M.
Canada Foundry Co.
Canadian Boving Co.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Cook, A. D.
Escher Wyss & Co.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Inglis & Co., John.
McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
Waterous Engine Works Co.
Mussens Limited.
Ontario Wind Eng. & Pump Co.
Wettlaufer Bros.

Quarry Machinery
Canadian Ingersoll-Rand Co.
Improved Equipment Co.
Lecky & Collis.
George Anderson & Co.

Railway Supplies
Canada Foundry Co.
Gartshore, John J.
Hopkins & Co., F. H.
Lecky & Collis.
Mussens Limited.

Refrigeration Machinery
Linde British Refrigeration Co.

Reinforcements, Concrete & Steel
Canada Steel Co., Ltd.
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.
Steel & Radiation Ltd.
Trussed Concrete Steel Co.
Turner, C. A. P.

Revolving Stone Screens
Greening Wire Co., B.

Road Asphalt
Canadian Mineral Rubber Co.
Barber Asphalt Paving Co.
Asphalt & Supply Co.

Road Machinery
Dore & Fils.
Erie Machine Shops.
Lecky & Collis.
Morrison & Co., T. A.
Mussens Limited.
Waterous Engine Works Co.
Western Wheeled Scraper Co.

Roofing Material
Asbestos Mfg. Company.
Barber Asphalt Paving Co.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

Ferranti Meters

Glass Case—Top Connections

Simplicity of construction.

Perfect accuracy.

Cyclometer or clock dials.

Top or bottom connections.

Prompt deliveries.

Every meter carefully inspected before shipment.

Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

WESTERN DUMP CARS

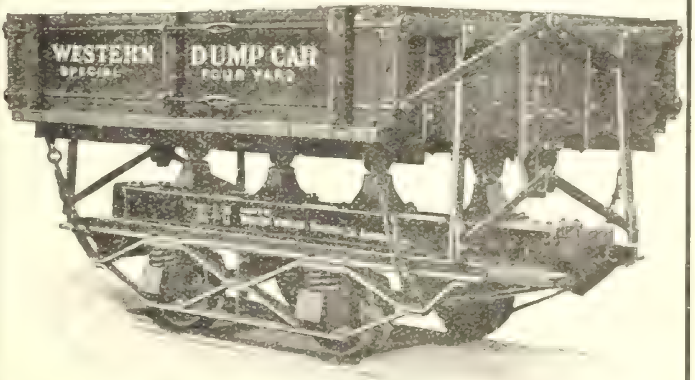
can be dumped and righted by fewer men and in less time than required for the same operation on many other cars

Prominent Contractors have made the above statement time and time again, and its a proven fact. Just think of the saving.

Western Air Dump Cars are used by many of the largest Railroads and at the Panama Canal. There must be many reasons.

Let us tell you them.

WESTERN WHEELED SCRAPER CO.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia



Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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Rubber Belting
[illegible] & Rubber Co.
[illegible]

Safes and Vaults
[illegible]

Sand and Gravel
[illegible]
[illegible]
[illegible]
Alfred Rogers Limited.

Screens
Canada Wire & Iron Goods Co.
Greening Wire Mfg. Co., B.

Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Sewer Pipe
Britnell & Company.
Canada Iron Corporation.
[illegible] Sewer Pipe Co.
Gartshore Thomson Pipe Co.
Joy & Son.
National Iron Works.
Ontario Lime Co., Ltd.
Ontario Sewer Pipe Co.
Smyth & Ryan.
Standard Clay Products Ltd.
Nova Scotia Clay Works Ltd.

Sewer Trenching
Lecky & Collis
Austin Mfg. Co.
Municipal Engineering.

Sound Deadening
Cabot Inc., Samuel.

Shovels (Steam)
Browning Engineering Co.
Beatty & Sons, M.
Canada Foundry Co., F. H.
Hopkins & Co., F. H.
Montreal Locomotive Works.
Mussens Limited.
Thew Automatic Shovel Co.

Shovels
Lundy Shovel & Tool Co.

Smoke Stacks
Des Moines Bridge Co
Hamilton Mfg. Co., Wm.

Stains, Shingle, Cement & Brick
Cabot, Inc., Samuel.
Pinchin, Johnson & Co.

Steam Apparatus
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Steam Turbines
McDougall Caledonian Iron Wks.

Steel
Canada Steel Co., Ltd.
Dominion Steel Castings Co.
Lecky & Collis.
Provincial Steel Co.

Steel Bars
Canada Steel Co., Ltd.
Steel Co. of Canada.
Steel & Radiation, Ltd.

Steel Ranges
McClary's.

Stone
Britnell & Company.
Brodie, James.
Consolidated Stone Company.
Contractors' Supply Company.
Corinthian Stone Company.
Crushed Stone, Limited.
Hagersville Contracting Co.
Mahan & Company.
McMillan & Son, W.
Morrison & Co., T. A.
Myers Oakley.
Queenstown Quarry Co.
Roman Stone Company.
Rogers Supply Company.
Sackville Freestone Company.
Sand & Supplies.
Smyth & Ryan.

Stone Saws
Anderson, Geo.

Structural Iron and Steel
Canada Steel Company.
DesMoines Bridge Company.
Dominion Bridge Company.
Dominion Steel Castings Co.
Hamilton Bridge Works Co.
Mackinnon Holmes & Co.
McNeil & Co., W. P.
McGregor & McIntyre.
Phoenix Bridge & Iron Works.
Provincial Steel Company.
Reid & Brown.
Sarnia Bridge Company.
Steel Company of Canada.
Structural Steel Company.
Standard Steel Construction Co.

Submarine Drills
Canadian Mineral Rubber Co.
Lecky & Collis.

Swinging Gears
Dake Engine Company.

Tanks and Stand Pipes
Chicago Bridge & Iron Works.
Des Moines Bridge Company.
Hamilton Mfg. Co., Wm.
Inglis, John.
Jenckes Machine Co.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Ontario Wind Eng. & Pump Co.
Piggott & Co., Thos.
Waterous Engine Works Co.

Testing and Inspecting Bureau
Hunt & Co., Robt. W.

Valves
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Company.
Canada Foundry Company.

Ventilating & Heating Apparatus
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Company.

Vacuum Cleaners
Tuec Company.

Varnishes—Insulating
Standard Underground Cable Co. of Canada, Limited.

Waterproofing
Cabot Inc., Samuel.
Can. H. M. Johns-Manville Co.
Canadian Mineral Rubber Co.
Ceresit Waterproofing Co.
Pinchin, Johnson & Company.
Wadsworth Howland Co.

Water Softeners and Filters
American Water Softener Co.

Water Turbines
Canadian Boving Co.
Escher Wyss & Co.
Hamilton Mfg. Co., Wm.
McDougall Caledonian Iron Wks.

Wires and Cables
Canada Wire & Cable Co.
Imperial Wire & Cable Co.
Standard Underground Cable Co. of Canada, Limited.

Wire Guards and Screens
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.

Wire Rope
Canada Wire & Cable Co.
Greening Wire Co., B.
Steel Company of Canada.

Wood Turnings
Lyster Wood Box Turning Enamelling Co.

These High-Grade Asphalts Insure High-Class Results

For 17 years "Pioneer" Asphalts have been specified by Engineers for important projects in which the highest efficiency and the greatest durability were of first consideration. The record of these materials is a record of success.

"Pioneer" Road Asphalt—For durable, waterproof, auto-proof macadam roads.

"Pioneer" Paving Cement—For reliable, economical Sheet Asphalt Pavements.

"Pioneer" Filler Asphalt—For filling the interstices in brick and block pavements. Sanitary—and always stays in place.

"Pioneer" Road Surface Asphalt—For building up macadam roads. Lays the dust—only one application a year necessary.

"Pioneer" Asphalt Mastic Floors—For manufacturing plants, breweries, canning establishments, ice plants, warehouses, etc.

"Pioneer" Asphalts have a Gilsonite base—99.5 per cent pure bitumen—and in actual service have established their supremaey. Specifications and further particulars on request.

In addition to the above we invite attention to "Pioneer" Mineral Rubber Pipe Coating "Pioneer Waterproofing Asphalt "Pioneer" Sewer Joint Asphalt, "Sterling" Waterproofing Products, Structural Paints, Roof Paints, etc., etc

THE CANADIAN MINERAL RUBBER CO., Ltd.

Montreal Winnipeg Victoria London, Eng.

Tarvia

Preserves Roads
Prevents Dust~

Beaurepaire Road, Beaconsfield, Quebec. New macadam road treated with two coats of "Tarvia B."

A Splendid Tarvia Highway

THE above photograph shows one of the many fine new roads in the Dominion which have been bonded with Tarvia to give a clean, strong, waterproof surface. The Tarvia work in this instance consisted of a treatment of two coats of "Tarvia B," which is the lightest and the cheapest kind of Tarvia treatment.

At a trifling expense, Beaconsfield thus secured a road surface capable of standing the traffic and needing very little maintenance. The saving in maintenance in itself will balance the cost of the Tarvia treatment. In winter or summer this road will give swift and easy traction. The Tarvia-bonded surface will shed water and the surface will afford good footing.

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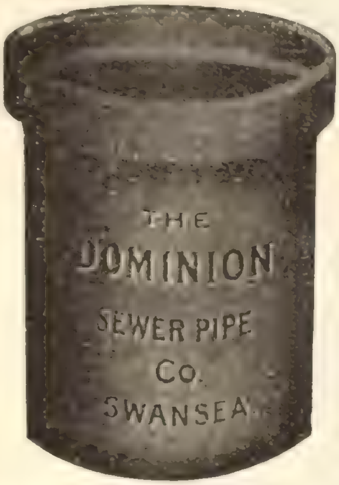

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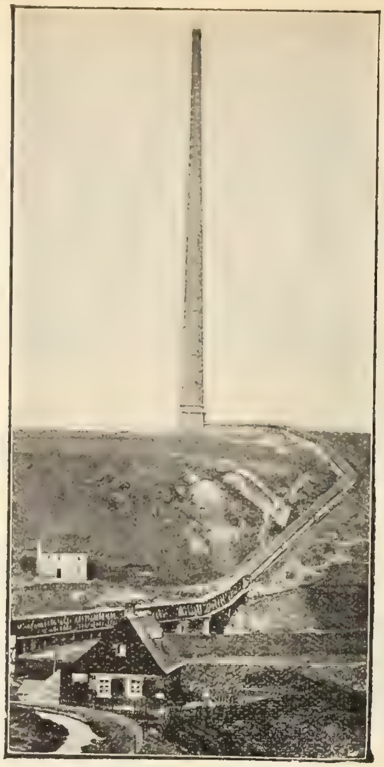

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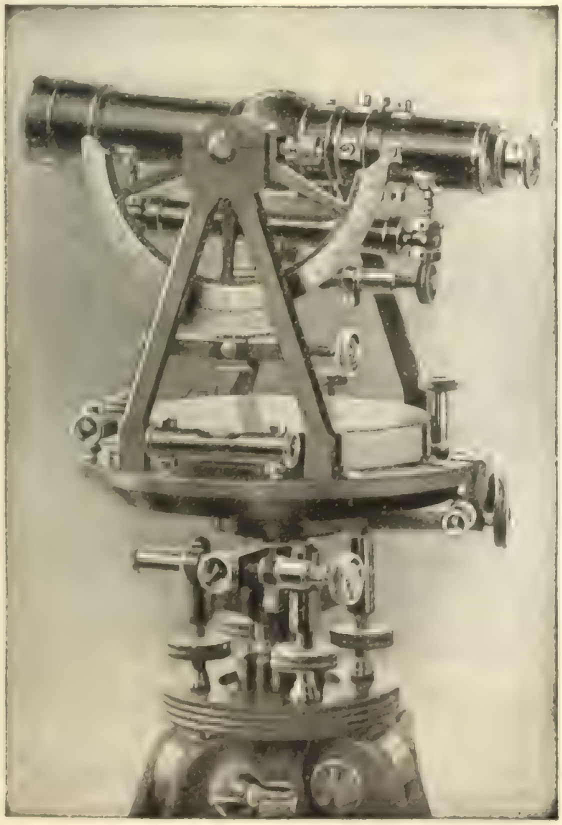

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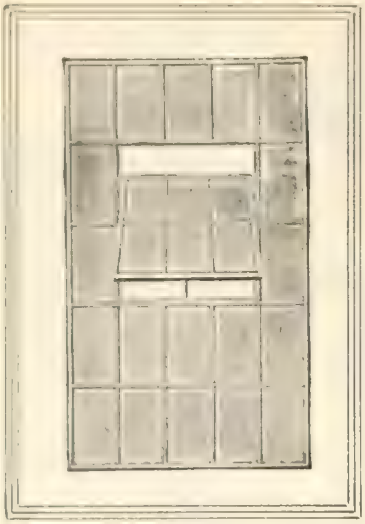

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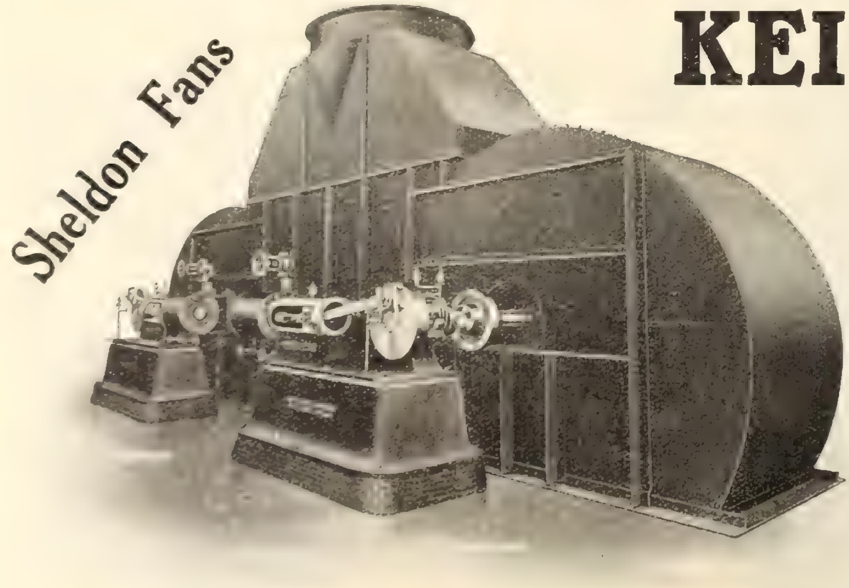

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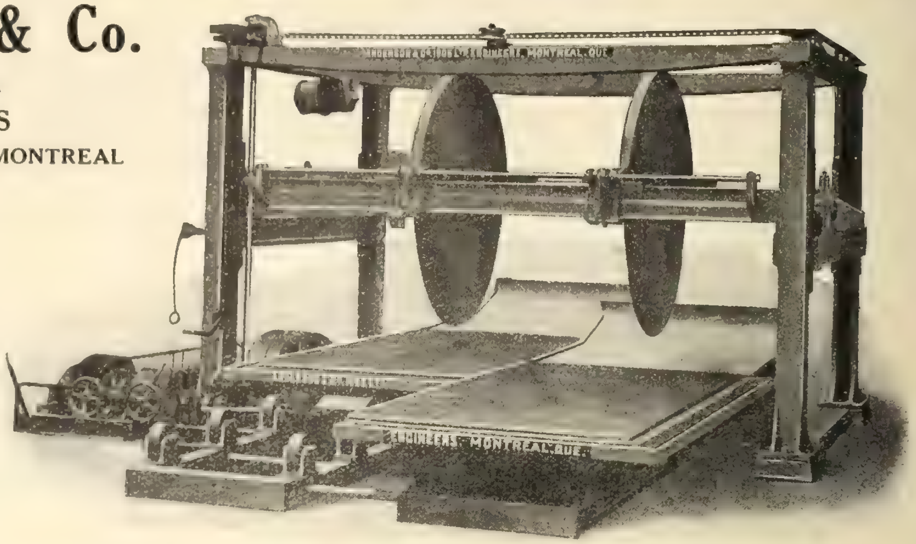

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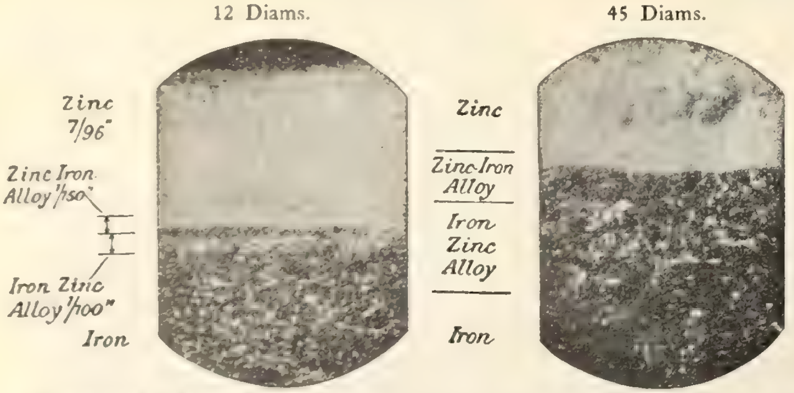

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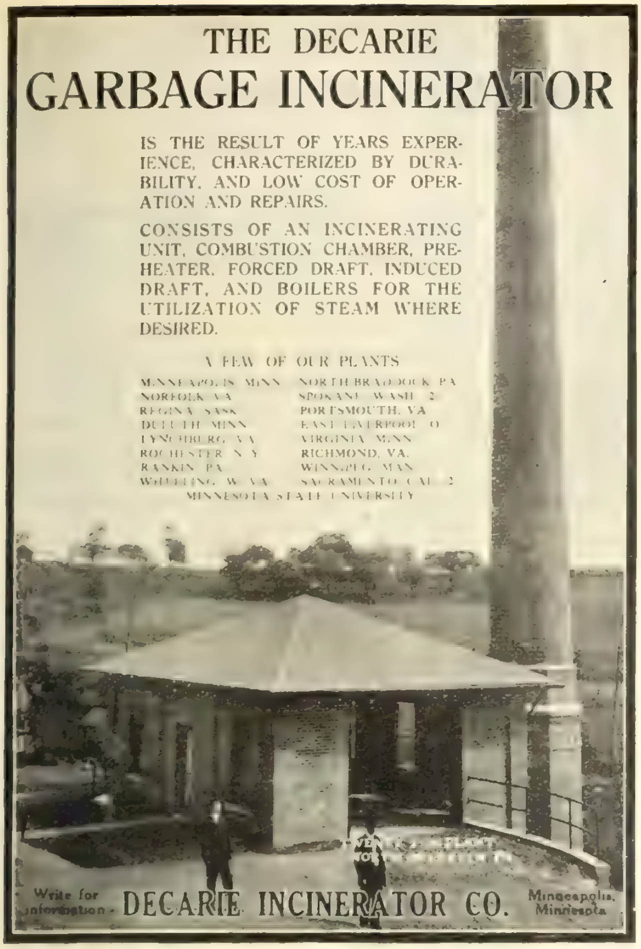

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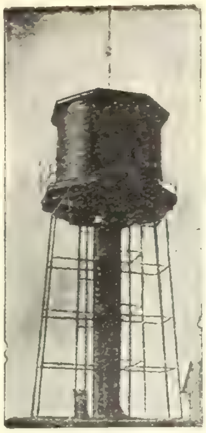

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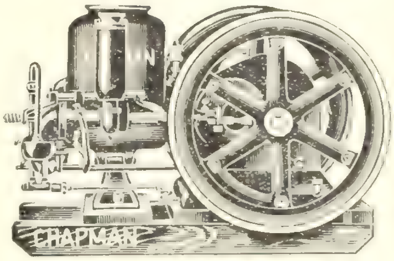

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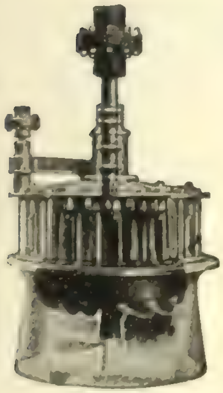

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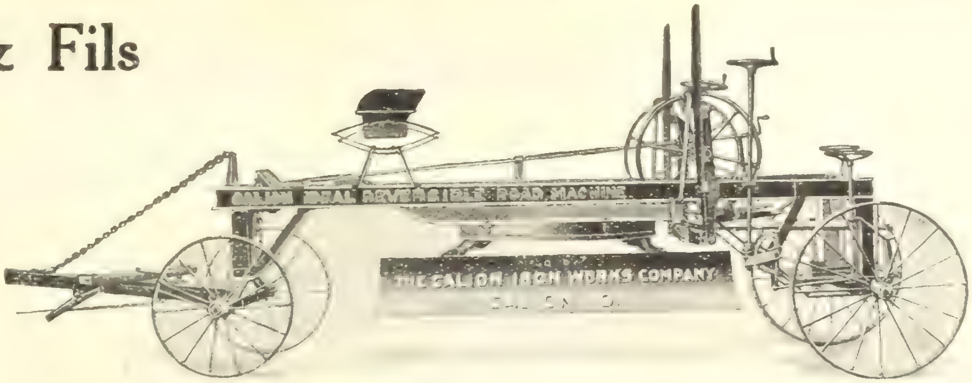
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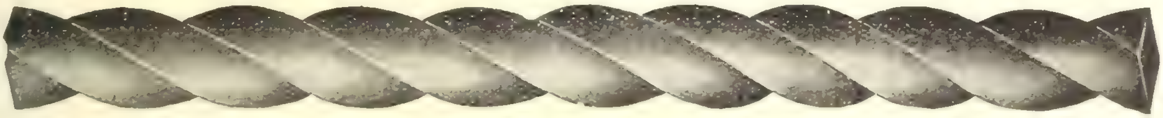

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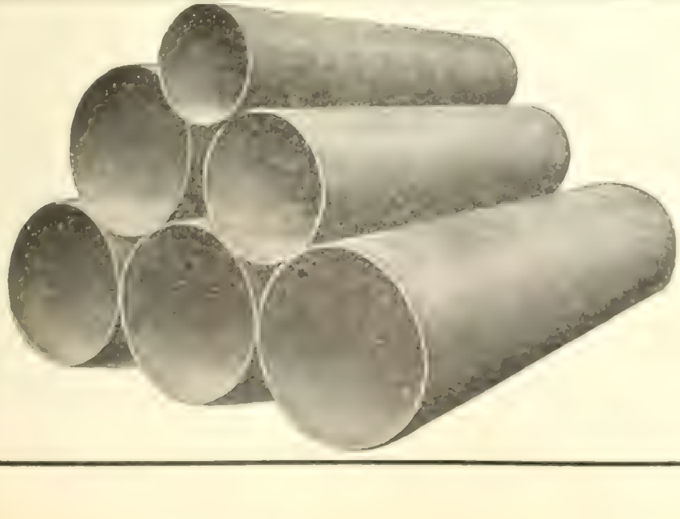

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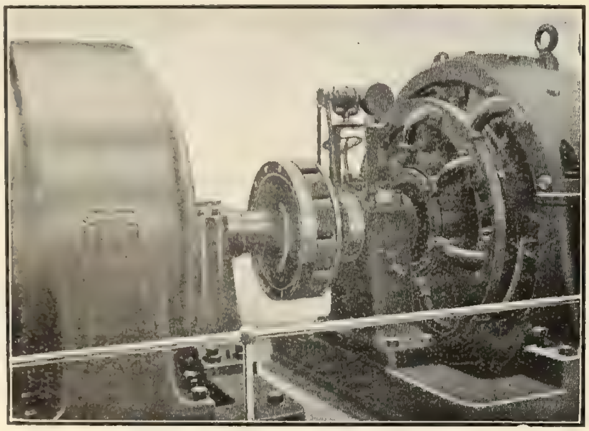

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Due to our increased capacity we can ship carload quantities in about two weeks from receipt order and full details at mill.

Triangle Wire Mesh

Manufactured from

Cold Drawn Steel Wire

Tensile strength 85,000 lbs. per sq. inch.
Every wire tested for its entire length by process of manufacture.
Furnished in rolls 150, 200, and 300 feet long.
No material wasted by lapping short lengths.

United States Steel Products Co. 30 Church Street, New York

Exporters of the Products of American Steel and Wire Company

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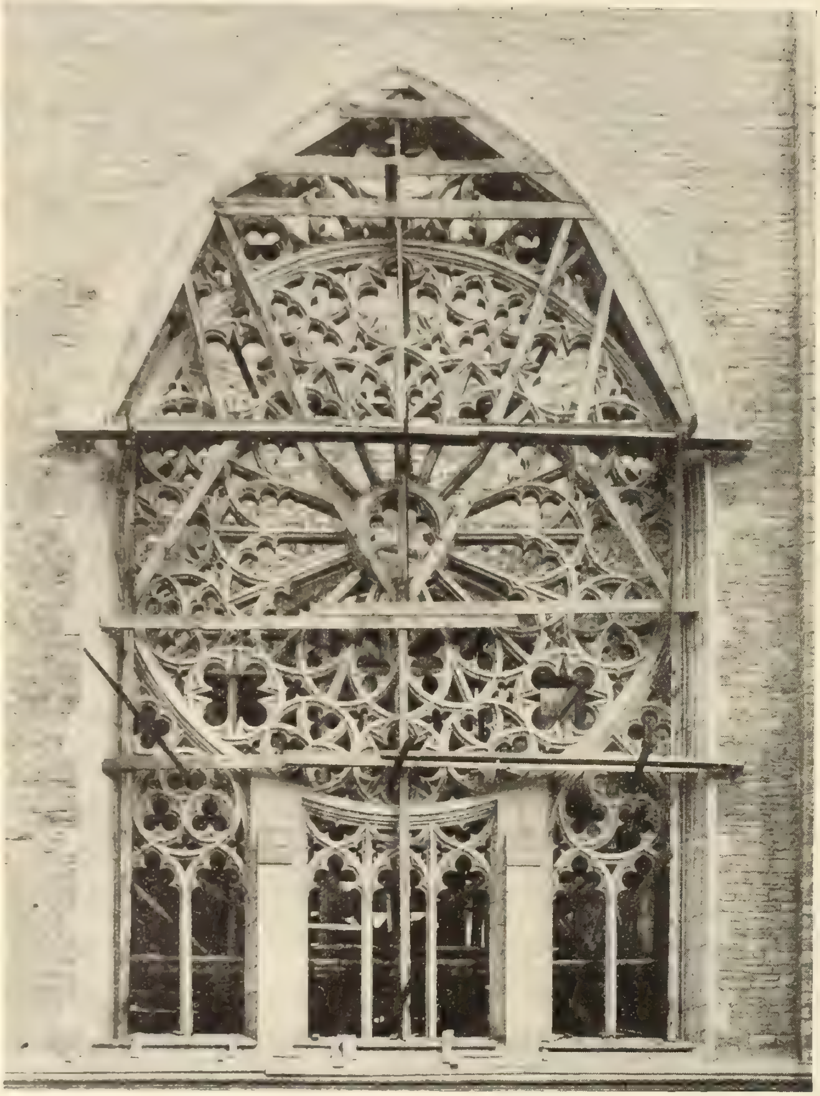
" " " " " - - P. O. Box 720, New Glasgow, N.S.

'For Engineers' Handbook and full details regarding Prices and LOCAL STOCK ON HAND, address any of above offices

ROMAN STONE



A window of St. Paul's Church, Toronto

The illustration shows an excellent example of the architectural possibilities of Roman Stone. It is of such fine texture and so strong that it can be carved and shaped to work out the most elaborate ideas.

Roman Stone has all the ***good*** qualities of natural stone with the additional advantage of being reinforced.

THE ROMAN STONE CO., LTD.

Business Office: **504 TEMPLE BUILDING, TORONTO, ONT.**

Drafting Room, Foundry
and Stone Yard,
Weston, Ont.

T. A. Morrison & Co.
204 St. James St., Montreal
Sales Agents for Quebec

Conveyor Belting
That Gives Real Service

For Grain, Gravel, Coal, Cement, Ore, etc.

Whether **you** are spending much or little on Conveyor Belting these **facts** should interest you.

Most of the big Canadian plants have installed **our** belting.

These **shrewd** buyers selected our belting because of its **unique** reputation—and after a **close** analysis of its qualities compared with **others.**

Because it was found to be best adapted to **Canadian** conditions—100% efficient in **Economy** and **Service.**

Possessing to an unusual degree—

Toughness of Surface - Tensile Strength - Flexibility

Our Conveyor Belting is not the product of **yesterday**—but a long established "Service" Belting that has maintained its leading position through **years** of competition.

It is the product of the **best** equipped plant in the country—plus the skill of **experts** familiar with **actual** working conditions.

It is the **one** belting that will solve the problem of "belting trouble" in your plant.

Let us make your next Conveyor Belt.
It will prove itself.

Canadian Consolidated Rubber Co., Limited

SALES BRANCHES:

Halifax, ST. JOHN, Quebec, MONTREAL, Ottawa, TORONTO, Hamilton, London, Berlin, Brantford, North Bay,
WINNIPEG, Regina, Saskatoon, Edmonton, Calgary, VANCOUVER, Victoria

The

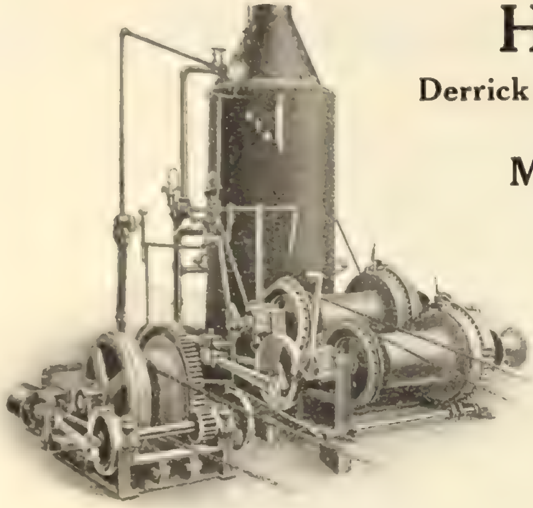
Doty Marine Engine and Boiler Co., Ltd.

Manufacturers of SUPERIOR

HOISTING ENGINES

Derrick Swingers, Material Elevators, Safety Mine Cages, Etc.

MARINE ENGINES BOILERS



This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.

Doty Engine Works Co. of Winnipeg, Ltd.
Foot of Water Street, WINNIPEG, Man.

Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT

The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

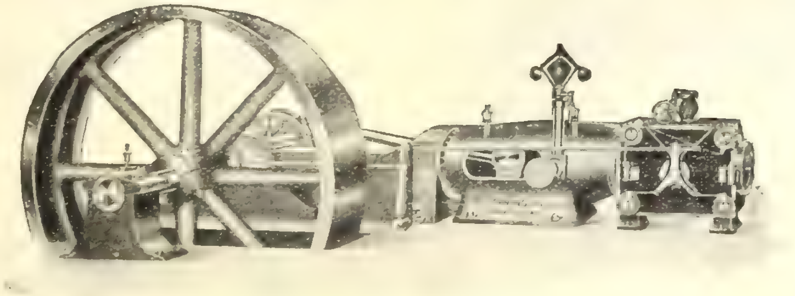
THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

It will pay you to investigate this shovel. Write for our catalog, C. R. It will explain the numerous features which make the Thew the most practical and economical machine of its kind on the market and will give you valuable information regarding cost of excavating.

The Thew Automatic Shovel Company, Lorain, Ohio

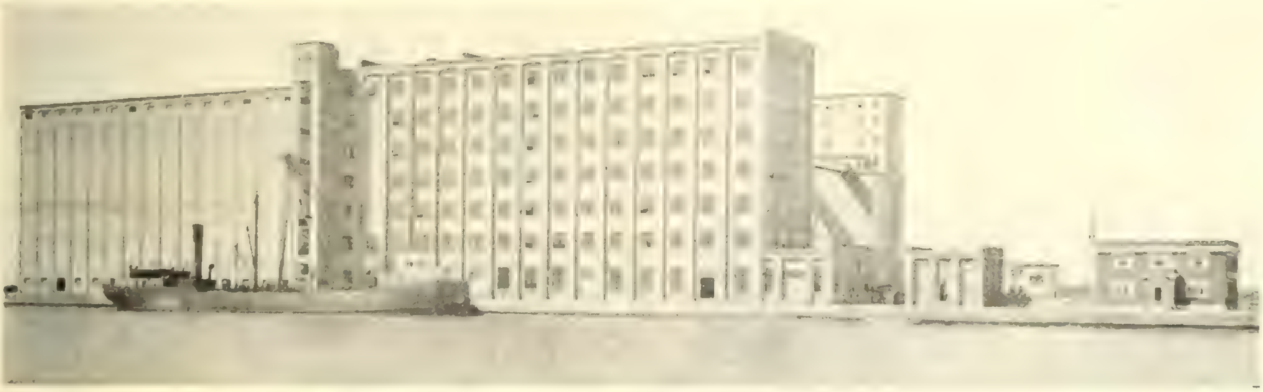
CORLISS ENGINES



THE value of Experience in the manufacture of "Inglis" Engines is emphasized by the ever increasing demand for our product.

Write us for particulars

The John Inglis Company, Ltd., 14 Strachan Avenue, Toronto, Canada
ENGINEERS AND BOILER MAKERS



The Maple Leaf Elevators, Port Colborne. J. H. Tromanhauser, General Contractor.
80,000 sq. ft. Barrett Specification Roofing on this building.

This building is but one of the many large contracts executed by us.
Our years of experience and large equipment are such as to enable us to handle these large contracts with promptness.
We can include for any specification along the lines of a Built-up Roof, Damp-proofing foundations, sub-floors, etc.
Kalameined and Tin Clad Fire Doors, Skylights, Cornice and all Sheet Metal Work.
Send along your plans and specifications at our expense, we will quote you a close price and return them promptly.

REGGIN AND SPENCE

Roofing and Sheet Metal Contractors

530 Front Street West - Toronto

Send for This Book on Concrete Pavements

Our booklet on concrete pavements illustrates and describes pavements in many different cities, giving cost data and describing in detail the methods used. Complete specifications for the ideal concrete pavements are included as well as instructions for installing Baker plates. This booklet is sent without charge to responsible engineers contractors and highway officials.

Longitudinal Section Showing Joint.

Cross-Section of Pavement Showing Expansion Joint.

Baker Armor Plates

Protect Your Concrete Pavement at its Weakest Point—the Expansion Join

Wayne County's 70 Miles of Concrete Roads Prove that the Baker Plate Has Solved the Expansion Joint Problem.

"The only surface repair required on our concrete roads has been on the roads first constructed, where the joints were not protected with the 'armor' plates."

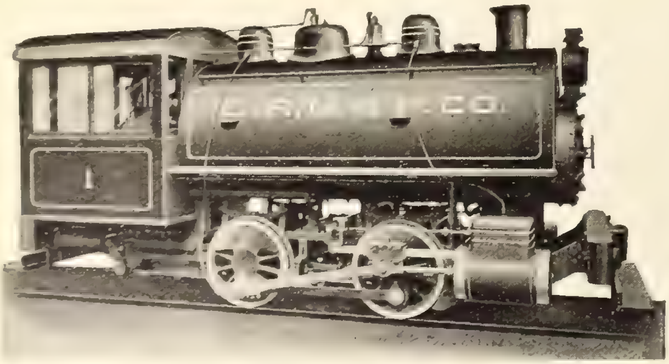
Extract from Sixth Annual Report of the Board of Country Road Commissioners, of Wayne County, Mich., Sept. 30th, 1912.

Our new system of installing Baker Armor Plates is simplicity itself, and holds the joint to perfect line and grade.

We guarantee Baker Armor Plates to be perfectly crowned as specified, and entirely free from defects of manufacture.

R. D. BAKER CO., 73 Home Bank Bldg.
DETROIT, - MICH.

INDUSTRIAL LOCOMOTIVES



The day has come when only the very best locomotive will meet the needs of contractors, quarries and switching around mines and industrial plants. It is now necessary to produce special designs to meet special needs. For years we have been busy studying the conditions in all fields where locomotives are used and have designed our locomotives to meet those conditions.

Proper designs insure efficiency, reduce the coal bills lessen repairs and give maximum work for a minimum of expense.

Our locomotives embody the best construction and are sturdily built. They are simple in design, and all wearing parts are accessible for easy repairs.

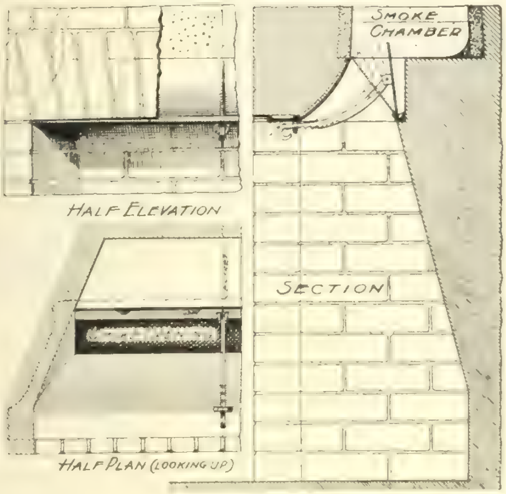
Interchangeable repair parts, sure to fit, are kept in stock for prompt shipment.

MONTREAL LOCOMOTIVE WORKS, LTD.

DOMINION EXPRESS BUILDING, MONTREAL, CANADA

Covert Improved Fireplace Damper

PATENTED



Forms Lintel to Support Brickwork.
Presents Smooth Surfaces to Lead Smoke to Flue.
Simplifies Mason's Work and Saves His Time.
Provides Valve to Regulate Draft and Ventilation.
Simply and Strongly Constructed.
Cannot Get Out of Order.
No Complicated Regulating Gear nor Piercing of Brickwork for Operating same.

Write for "Hints on Fireplace Construction"

Black Building Supply Company, Limited
MAIL BUILDING, - TORONTO

Reynolds-Wardwell Co., Limited MONTREAL
Gandy & Allison ST. JOHN, N. B.
John McKay HALIFAX, N. S.

TOCH BROS. No. 232 "R. I. W." EST. 1848
REMEMBER ITS WATERPROOF
R. I. W.

DAMP RESISTING PAINT

MANUFACTURED IN CANADA

INSULATES
CHECKS DAMPNESS
BONDS PLASTER TO BRICKWORK
SAVES COST OF FURRING

Write for
Edition of "Red Book"

R. I. W. DAMP RESISTING PAINT CO., TORONTO

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Bermudez Road Asphalt

A Different Book About Good Roads

and how they are constructed with Bermudez Road Asphalt, has been issued by the Road Department of this Company.

The booklet is different because Bermudez Road Asphalt is unlike any other road binder.

Bermudez Road Asphalt is the only *lake* asphalt macadam binder.

It comes from Bermudez Lake, Venezuela, where it has been subjected to the influence of the elements for centuries.

Heat, cold, wind and water have made every change that can be made in Bermudez Asphalt *before* it goes into roads. That is why

"It Stays Put"

and does not bleed, volatilize, coke, and lose its cementing power after a few seasons' wear and exposure.

The Bermudez Road Book tells about the fixed qualities of a known product—as distinguished from the mysteries and uncertainties of tars, oils, residuums, and by-products of unknown and variable characteristics.

Another reason why you will value the Bermudez Road Book is that it contains useful tables showing stone costs and quantities required for roads of various widths; number of gallons of binder needed for different-width roads, etc.

Send for the Bermudez Road Book today

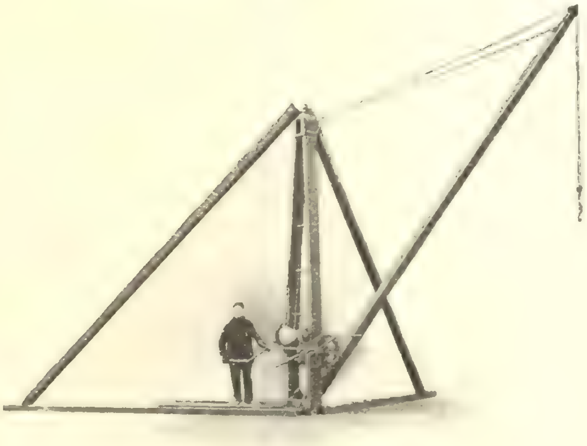
Road Department

The Barber Asphalt Paving Co., Philadelphia, Penn.

Offices in all Principal Cities

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

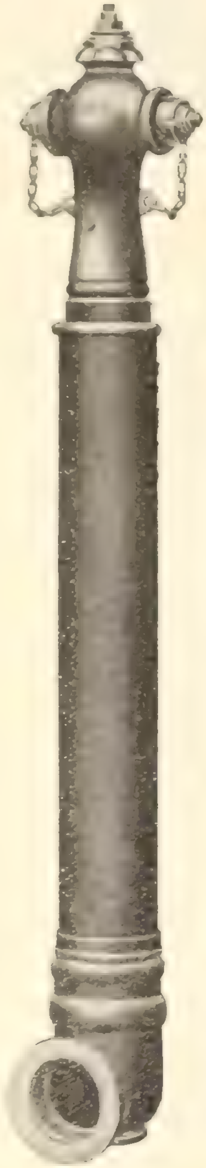
KERR

Hydrants

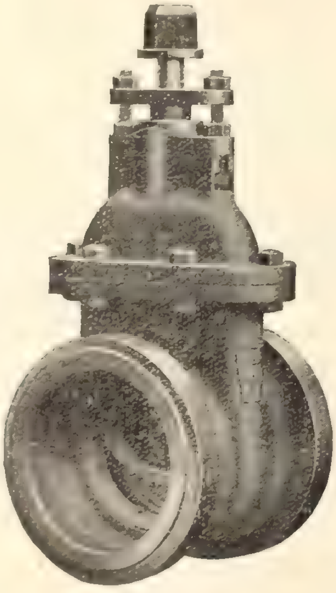
and

Gate Valves

are made with Hub for Cast Iron, Wood or Steel pipe spigots. They have full area of waterway, and are strong, compact and modern in design and construction.



Standard Compression Hydrant

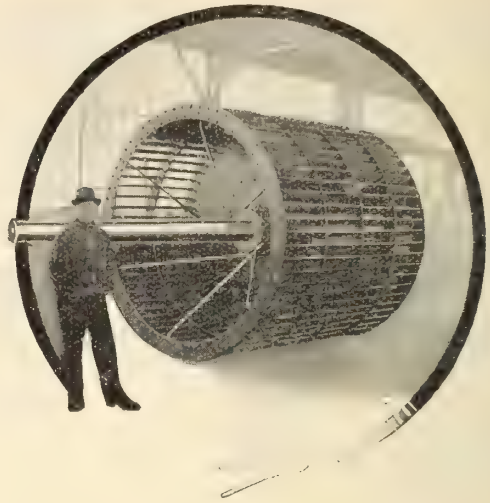


6″ Hubbed

Send us your Specifications and Enquiries.

Prompt attention given.

THE KERR ENGINE CO.
LIMITED
WALKERVILLE, ONT.



Fresh Air for 9,000 People Delivered by ONE

"Sirocco"

TRADE MARK.

Ventilating Fan

The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5″ water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

Let us tender on your next requirements. Bulletin No. 3401 is descriptive of the construction and operation of "Sirocco" Fans. You should have a copy.

CANADIAN Sirocco COMPANY
LIMITED
WINDSOR, ONTARIO.

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CLARK T. MORSE, 301 McGill Bldg., Montreal
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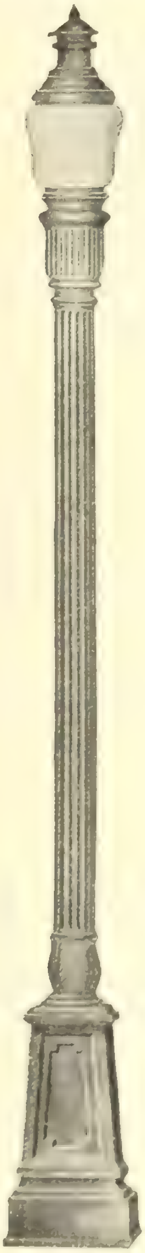
MORRIS
Street Lighting Poles



Modern Ideas in Street Lighting

Send for Descriptive Bulletin and Prices

Canadian Distributors

L. H. Gaudry & Co., Ltd
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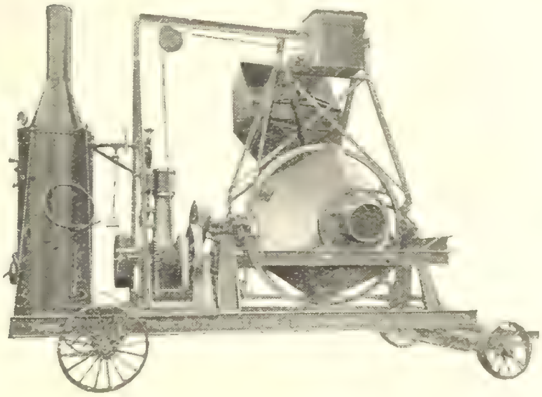
Aull Block
CALGARY, ALTA.

Chosen Mixers
for the
World's Biggest Concrete Works



Over 5,000,000 Cubic Yards of Concrete will be employed constructing ship locks, dams, docks, lighthouses, bridges, buildings, retaining walls and minor structures for the Panama Canal.

Austin Improved Cube Mixers were chosen

Over 1,000,000 Cubic Yards of Concrete were employed in constructing the Los Angeles Aqueduct, 200 miles long.

Austin Improved Cube Mixers were chosen

Over 100,000 Cubic Yards of Subaqueous Concrete were employed in constructing the Detroit River Tunnel.

Austin Improved Cube Mixers were chosen

In all these works great volumes of high quality concrete at a rapid rate of output were demanded—that is why Austin Improved Cube Mixers were chosen.

Where Quality of Mixture is Paramount Austin Improved Cube Mixers Have No Equals.

Write for Catalogue No. 8

Municipal Engineering & Contracting Co.

Main Office: Railway Exchange Bldg., Chicago, U. S. A.
Eastern Office: 90 West Street, New York City, U. S. A.

Represented in Eastern Canada by
LECKY & COLLIS, Ltd., 335a Craig St. West,
ontreal, Que., and Napanee, Ont.

Represented in Western Canada by the
CANADIAN EQUIPMENT & SUPPLY CO., Calgary
E. G. CULLEN, Vancouver
Agents wanted in open territory

Carbonizing Coating Paint

The most durable and least expensive Paint made for preserving Iron or Steel in Bridges, Buildings, Structural Shapes, Gas Plants, etc.

Galvanum Paint

The only Paint that will adhere for years to Galvanized Iron roofing, siding, cornices, etc.

Concrewaltum Paint

The only Paint that will beautify and make walls, ceilings, tile, concrete, brick and stone walls moist-proof and sanitary. Produced with strong luster finish or semi-luster, or flat finish. Can be frequently washed without injury.

Manufactured in the United States and England by

The Goheen Manufacturing Co.

CANTON, OHIO., U.S.A., and Dock House, Billiter St., LONDON, E.C., ENG.

For sale by SANDERSON PEARCY & CO., LIMITED, Toronto, Ontario, Canada

Fort Garry Hotel, Winnipeg
Architects, Ross & MacFarlane Contractors, Geo. A. Fuller Co., Ltd.
Structural steel painted with "Superior Graphite Paint"

THE SELECTION OF

"SUPERIOR GRAPHITE PAINT"

By the leading architects, for the protection of structural steel of all kinds is its best recomendation.

IT'S USE

INSURES

The proper protection of steel, whether enclosed or exposed, from

Damage by Rust or Electrolysis

Made only by

DOMINION PAINT WORKS, LIMITED

Montreal
Toronto

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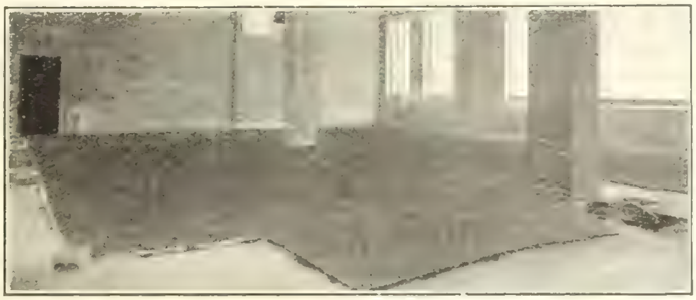
Made in U.S.A. by DETROIT GRAPHITE CO. Detroit, Mich.

J-M Mastic makes floors practically proof against acids, water and wear.



Floor in Warehouse of D. Auerbach & Sons, N. Y. J-M Mastic being applied.

This flooring is all mineral, having a natural asphalt for its base. Water and acids have absolutely no effect on it. It is practically indestructible. Will outwear any other type of floor.

Being waterproof, J-M Mastic Floors can be quickly and thoroughly cleaned by the simple process of flushing. It dries immediately. Absolutely sanitary—will not originate or hold dust.

Slipping is impossible on a J-M Mastic floor on account of its peculiar "holding" quality.

Although dense, J-M Mastic has a resiliency which adds to the comfort and efficiency of those who are compelled to stand while at work, and it does not cause foot-soreness and fatigue like concrete and other hard, non-yielding floor surfaces.

J-M Mastic can't be equalled for factory use. It is the cheapest per-year floor.

Write our nearest Branch for full particulars.

THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED

Manufacturers of Asbestos and Magnesia Products
ASBESTOS
Asbestos Roofings, Packings, Electrical Supplies, Etc.

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John T. Hepburn

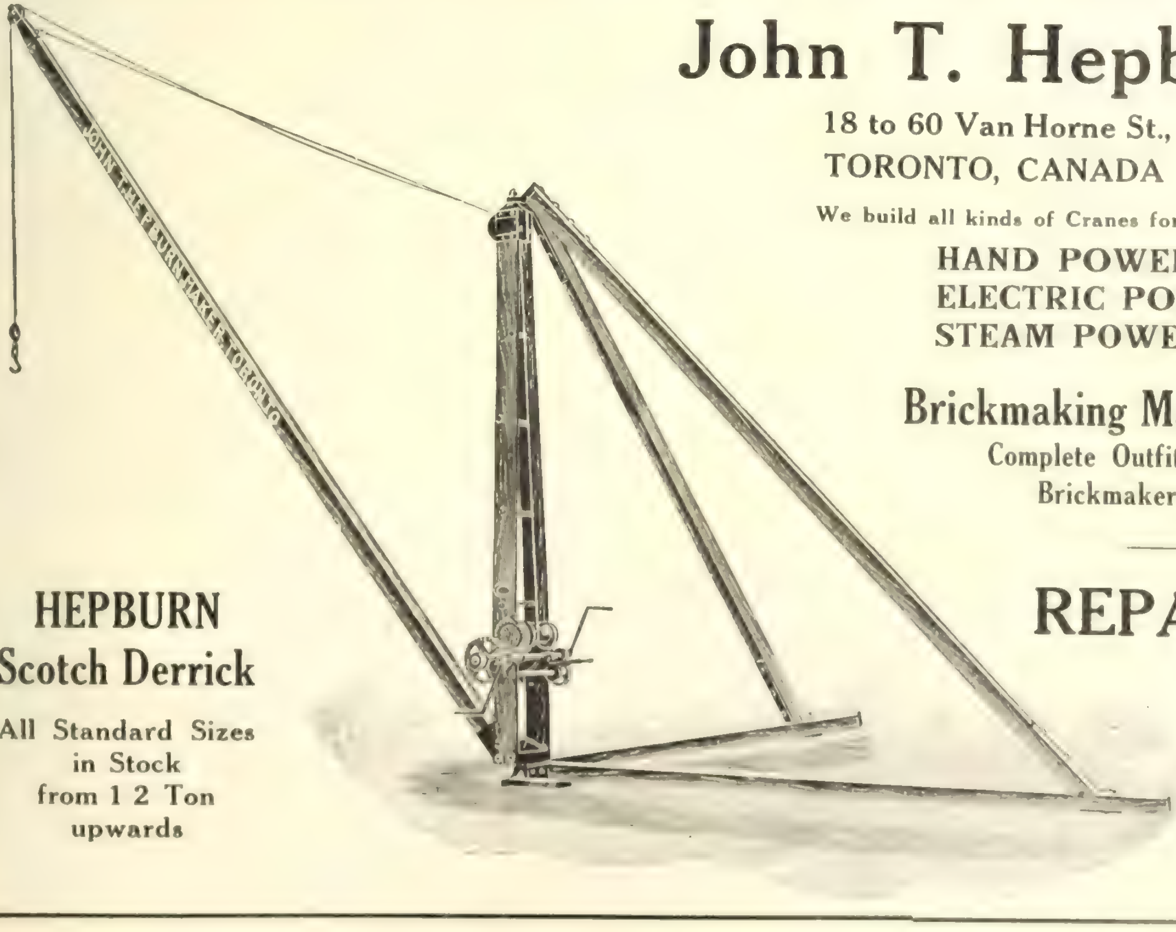
18 to 60 Van Horne St.,
TORONTO, CANADA

We build all kinds of Cranes for

HAND POWER
ELECTRIC POWER
STEAM POWER

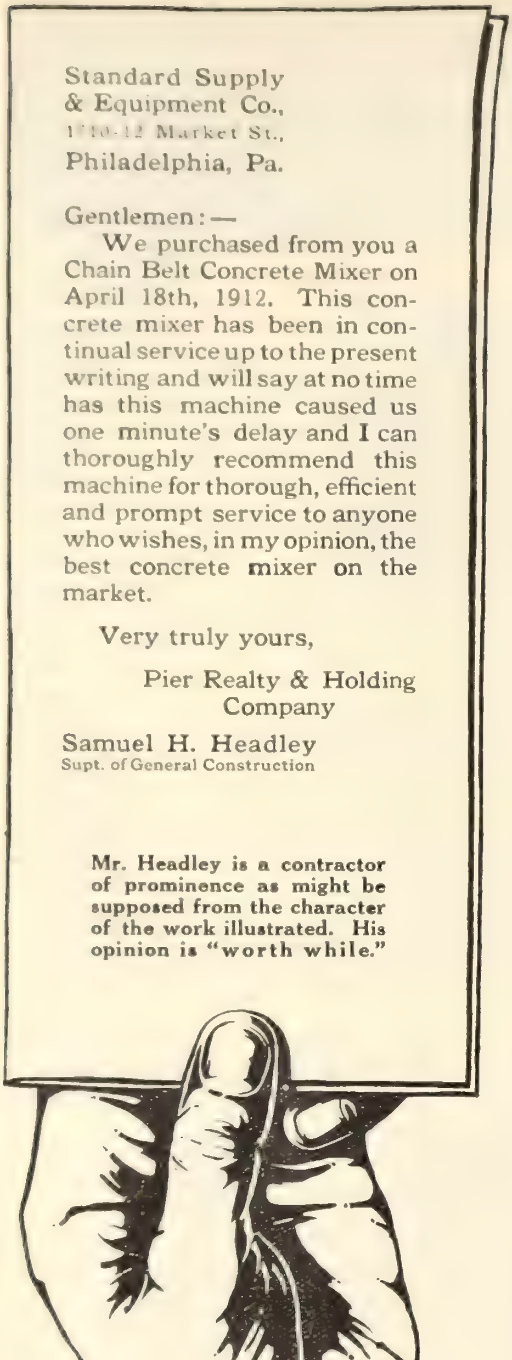
Brickmaking Machinery
Complete Outfits for
Brickmakers

REPAIRS


JOHN T. HEPBURN MAKER TORONTO

HEPBURN
Scotch Derrick

All Standard Sizes
in Stock
from 1 2 Ton
upwards



Standard Supply
& Equipment Co.,
1710-12 Market St.,
Philadelphia, Pa.

Gentlemen:—

We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding Company

Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

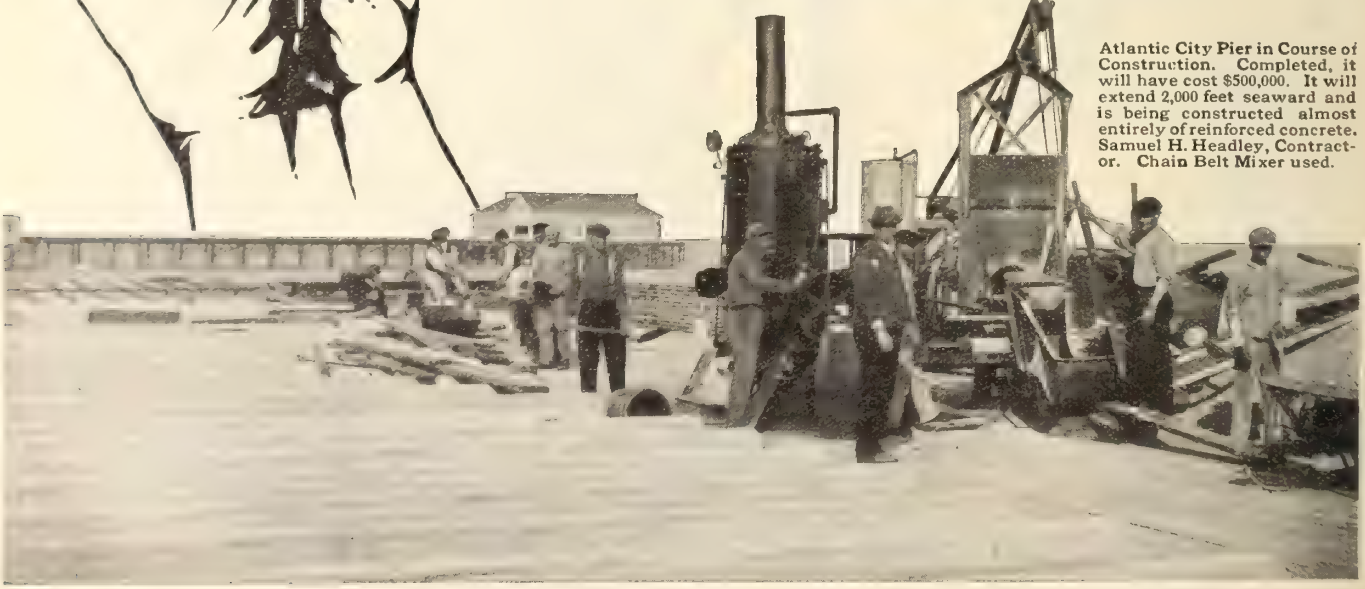
There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixernow. What size do you require?

CHAIN BELT COMPANY

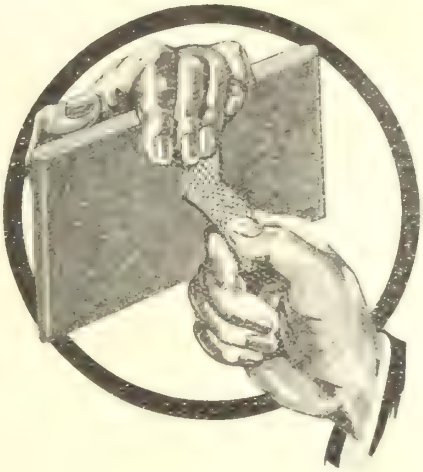
MILWAUKEE, WISCONSIN

**Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.**



Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

GOODYEAR



Try pulling this Belt apart

That will give you some idea of the enormous strength built into Goodyear Belts. Not an ounce of untested rubber is used, not a roll of untested duck. Each finished Belt is inspected before shipping *to make sure* that it will stand the *wear* and keep *pliable.*

The Goodyear system of Belt making is calculated to give the greatest efficiency in practical Belt Service.

A close, clinging grip of the pulleys · absolutely non-slipping. Goodyear Rubber Belting gives this cohesive contact because of its yielding rubber surface, and the practical result is an immense saving of power.

Pliability under all conditions. A belt must be pliable to grip the pulleys. The hard cotton fibre of Goodyear Belting is permeated under tremendous pressure – with rubber. The treated layers are compressed into an homogeneous mass. This preserves the pliability of rubber in the finished Belt.

Entire absence of "stretch." The "curing" or vulcanizing of Goodyear Belting is performed whilst the Belt is stretched to the limit of safety in a special machine. "Stretch" in service therefore is impossible. This means no stopping of machines for adjustment – no idle machines, no idle men.

Enormous strength. The union of carefully tested hard-fibre cotton with tenacious and elastic rubber "friction" –compressed to make the plies practically inseparable – gives a combination of prodigious strength. A Goodyear Rubber Belt is as nearly unbreakable as any Belt can be.

Long Life. The duck or fabric of Goodyear Belting cannot be reached by water, or anything else that would set up rot and destroy the Belt. A Goodyear Belt renders long and efficient service. 104

GOODYEAR

Rubber Belting

Factory Superintendents specify Goodyear Belting. They are satisfied that Goodyear Rubber Belting puts the plant on a power-saving basis. Write for free Book on the choice of a belt.

The Goodyear Tire & Rubber Co. *of* Canada, Limited

Head Office TORONTO
Branches at
Factory Bowmanville, Ont

Victoria Vancouver Edmonton Calgary Regina
Winnipeg Hamilton London Toronto Montreal St John, N. B.

ELECTRICAL
Wires and Cables
In
Copper and Aluminum
Copper Clad (Duplex Metal) Wire

Galvanized Steel Strand for Guys

Canada Wire & Cable Co., Limited
1170 Dundas St., Toronto

Stock of Wire and Cable carried in
TORONTO, MONTREAL & WINNIPEG

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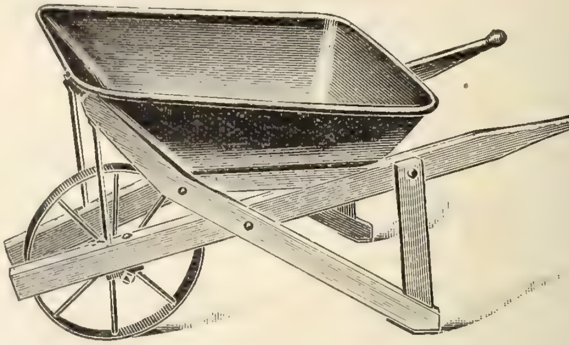
IRON AGE



CONTRACTORS' SUPPLIES

As makers of the high grade "Iron Age" products we solicit your trade in the following lines:—

DRAG AND WHEEL SCRAPERS—
Each Drag Scraper is pressed from a solid sheet of high-carbon steel—no joints or seams. Our Wheel Scrapers have all the latest dumping attachments and are supplied with either pressed or square bowl. All "Iron Age" Scrapers are of standard capacity.

STEEL TRAY BARROWS—
The trays are pressed from a solid sheet of high-carbon steel and the edges are turned over. Fitted with heavy steel wheels, hardwood frames, long handles, in fact the whole construction is thoroughly substantial.

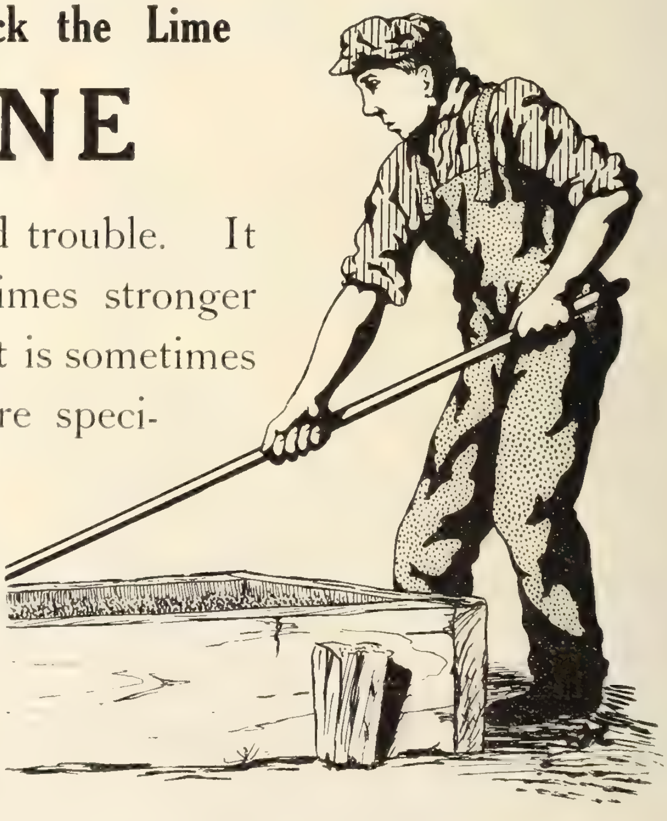
PICK AND ROOTER PLOUGHS—
Nothing to break, bend, or get out of repair. Ten horses can be used without straining the parts.

Write us for catalogues

THE BATEMAN-WILKINSON CO., LIMITED
340 CAMPBELL AVE., TORONTO

Save the Time it Takes to Slack the Lime
PARISTONE

Hard Wall Plaster saves time and trouble. It makes a permanent wall many times stronger than lime mortar. Your final cost is sometimes less, seldom more. Architects are specifing it for the most expensive buildings and contractors are using it on the smallest jobs.



If your dealer does not handle it, write

The Alabastine Co., Limited
Paris, Ontario

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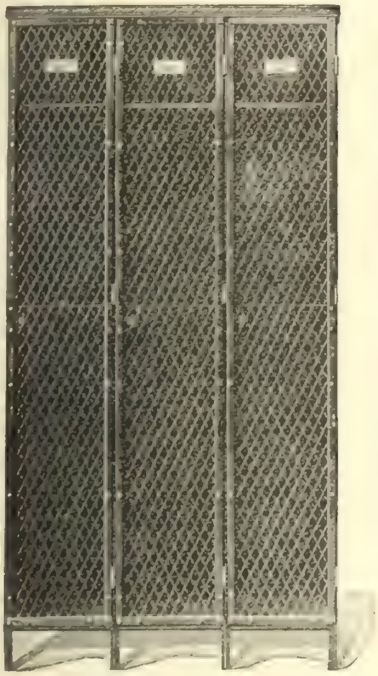

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Vol. 28 **May 14, 1913** **No. 20**

New Building By-law of the City of Toronto

Original Members of Citizens' Committee

IN an editorial article on the above subject published in our Annual Number of April 30th, 1913, we reviewed the changes that had been made in the Toronto building code and pointed out the need for further revision, urging that the work should be commenced immediately. Enumeration was made of the matters most in need of further attention. At the close of the article, in paying a tribute to the work of the Citizens' Committee, we purported to give a list of its original members. Owing to an oversight, this list was incomplete. Following is the complete list of the original members of the Citizens' Committee that should have been given: Chairman, Mr. C. M. Canniff; secretary, Mr. C. R. Young. Committee: Messrs. Gustave Kahn, C. D. Lennox, R. L. McIntyre, T. Harry Mace, Edwin Menges, J. P. Murray, C. W. Noble, J. Morrow Oxley, John A. Pearson, W. C. Phillips, Thomas Roden, L. J. Street, W. E. Wagner, A. F. Wells, Murray A. White, C. R. Young, John Aldridge, C. H. Acton Bond, Geo. Brigden, C. M. Canniff, A. W. Connor, Arthur Dinnis, W. F. Evans, J. Galbraith, P. Gillespie, H. B. Gordon, A. H. Gregg, A. H. Harkness, Robt. F. Havlik, J. C. B. Horwood and W. Ford Howland

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The failure of the motor sledges employed in the ill-fated Scott expedition shows that there is scope for much development in this section of motor engineering. Sir Ernest Shackleton also had trouble with the motor sledges that accompanied his expedition. Curiously enough, the cause of failure, at least as far as the engines themselves were concerned, was overheating. Water cooling was, of course, out of the question since it would instantly freeze and so crack the cylinders, etc. Air cooling, therefore, had to be resorted to, with the result that overheating occurred. This may possibly be explained by the fact that the rate of propulsion was so slow that a sufficiently strong current of air was not generated, the efficiency of air cooling depending to some extent on the speed attained. Another theory put forward is that the extreme dryness of the Arctic air or some other peculiar atmospheric condition is responsible.

Safeguarding the Workman and the Public

AN interesting feature of the construction of the new fifty-five storey Woolworth Building, in New York City, was the fact that the advanced ideas that underlie modern liability insurance were exemplified in an interesting manner, the inspection service rendered during the work being particularly worthy of note. The insurance company that carried the liability kept two inspectors on duty continuously, and immediately upon noting a condition which was likely to result in an accident, they notified the proper foreman or superintendent, and saw that the danger was removed. Their recommendations were also reported to the office of the engineering and inspection division of the insurance company, and written copies were then sent to the contractors.

Patent scaffolds were used for the brick-laying throughout the work, and these were covered, so far as possible, with substantial wire-mesh roofs, to protect the men at work upon the platforms from tools and materials that might fall from above. The sides of all the scaffold platforms were also protected by guard rails and by wire-mesh screens. Substantial bridges for the protection of pedestrians and others were built over the sidewalks, and these were made stout enough to resist the impact of any material that might fall upon them. Platforms 20 feet wide were also built out from the building at four different heights, to catch any material that might fall, and prevent it from descending into the street. Wire-mesh screens were arranged along their outer edges to give still further security.

All the hoisting apparatus was examined frequently and thoroughly by expert elevator inspectors; employees were not allowed to ride on material hoists, and the maximum number of persons who might be permitted to ride on a passenger hoist was definitely specified in each case. All hoists, whether used for the transportation of men or of materials, were covered overhead, to prevent accidents from falling objects. The hoist openings were effectively fenced, and were guarded by rails where the materials were loaded or unloaded. Openings in the floors were thoroughly guarded by rails or fences or otherwise. All stairways, whether temporary or permanent, were required to be rail-guarded. Proper lighting was insisted upon, particularly at work places, along gangways and passages, and at every other important point. Warning signs were put up at all dangerous places. Laborers engaged in cutting concrete and other similar substances were obliged to use chisels fitted with protective handles, so that their own hands would not be injured if the strikers should miss the heads of the chisels. An effective watch was kept for nails and other similar sharp metal points projecting from the woodwork or from loose planks or boards or elsewhere. These are prolific sources of injury, and the men were required to remove them at once. First-aid cabinets were also provided, at the suggestion of the liability inspectors.

It will be apparent that the comparative freedom from accident that characterized the erection of the Woolworth Building was not the result of chance, but that it was the logical outcome of the practical system of inspection that was adopted.

Relation of the Consulting Engineer to the Operating Engineer

THERE is a feeling more or less prevalent among operating engineers, especially of smaller plants, that the consulting engineer has no excuse for being in existence and that he is encroaching on the field of the operating engineer if he is called into the plant to make any suggestions or changes in the plant equipment or in the method of operating the plant, says F. W. Rose, a consulting engineer of Minneapolis, writing in the Engineering Record.

This feeling is due to several different things, one of which is the fact that the operating engineer in times past was required to do the work of the consulting engineer, if such work was done at all, as well as his own work. This was expected of the operating engineer by the owner of the plant or those having the plant in charge, and even to-day this is true to a very large extent.

Another reason is the fact that a great many consulting engineers have taken up a proposition in a purely technical way without gaining the confidence of the operating engineer, or conferring with him about the practical arrangements which may seem to be necessary to the successful operation of that particular plant, and which the operating man has learned through actual experience. No man is so wise that he cannot gain more experience, and the truly successful engineer, either operating or consulting, is only too glad to get new ideas. But as long as the consulting engineer sets himself up as being so far above the operating man that he cannot even confer with him there will be more or less friction in the relationship of the two.

Another factor in the situation is that a very large number of manufacturers, agents of manufacturers and contractors go to the owner or operating engineer and say that they will prepare all plans and specifications that are necessary for the work in question without making any charge for their work. They do this, of course, with the expectation of getting the business, and in most cases where possible the work is laid out so that their particular make of apparatus or equipment will show up as being the best suited for that particular job; and these men, even when well qualified for doing that class of work, are working, necessarily, from a more or less biased point of view, due to the fact that they are selling a particular make of apparatus or equipment, which may or may not be the equipment best suited to a particular plant.

When work is handled in this way, the operating engineer and the owners are under the impression that they are getting their engineering done without any expense whatsoever, while the fact is they are paying just as much as, and in a great many cases more than, if a consulting engineer had been employed for the work; because this cost of engineering when done by the manufacturer or contractor must be added to the selling price of the apparatus or equipment. Very often the man who pays the bills has to pay more in the end than he would have had to pay if there had been more competition for the business.

The operating man, if he is a man of any ambition, wishes to stand high in the estimation of his employer, and he very often tries to gain this esteem by posing as having the ability to handle any engineering proposition that arises in connection with his plant, and his employer, not being familiar with engineering as a profession, thinks that the operating man should know, and follows his advice, which in a great many cases proves very satisfactory. This same employer if he wanted legal or medical advice would not think of going for that advice to a printer of law books, or to a man who made a business of mixing drugs, but would go to a specialist of the legal or medical profession.

The operating man is frequently one who has got into a rut along certain lines, and the consulting engineer must use a certain amount of diplomacy to bring him around to looking at things from a more up-to-date view, for the consulting engineer is expected to keep up more closely with the modern ideas along engineering lines.

The consulting engineer is not necessarily a man who is capable of producing the very best results as an operating man, although if he has those qualities so much the better; but he must at least be a man of good practical experience and a large amount of common sense.

The field of the consulting engineer, while a much wider field, is just as marked as that of the operating man, although each overlaps the other and both are very closely connected. To produce the best results, both the operating engineer and the consulting engineer must maintain harmonious relations at all times.

Keeping the Camp Contented

WHILE tuning up his material equipment for the coming season the contractor should not lose sight of the factors which influence the efficiency of his human equipment, says the Engineering Record in an editorial from which this article is extracted. One of the first requisites on a well-organized contact is to hold men on the job, for when changes are constant much energy is wasted in teaching raw recruits, and time and money are lost through errors of omission and commission due to inexperience. Keeping a camp in proper sanitary condition and providing wholesome diversion for unoccupied hours will go far in preventing unrest and should, therefore, not be overlooked. The provision of entertainment is especially important when a camp is isolated. Such provisions are being made with growing frequency.

In regard to sanitary measures a note from the Elephant Butte Dam, in New Mexico, is significant. A large number of fly traps of the cone variety will shortly be installed, while a 10 per cent. solution of carbolic acid will be sprayed in corrals and fly-breeding and mal-odorous places. Moreover, the septic tanks have been floated with crude oil to destroy mosquitoes and other surface-breathing insect pests. In passing it may be worth noting that by such crude-oil applications the anaerobic bacterial action in the tank is increased.

Satisfactory housing of employees is also being given a great deal more attention than formerly.

The maintenance of club houses has long since ceased to be a novelty, but is apparently still regarded as a luxury by many contractors. Inquiry among those who have provided club houses will convince anyone that such institutions are in reality dividend payers. Labor conditions at the Missouri River Bridge, for example, some years ago were decidedly bettered by the establishment of a club house, and the increase in the number of men reporting for duty on Monday morning was especially noticeable immediately after the establishment of this recreation center. In 1908 at the Granite Reef Diversion dam, where the intense heat made life almost unbearable, a cool building with concrete floors and screened sides, was furnished with chairs and tables. Here refreshments were sold by the commissary, while on occasions two or three Spanish performers strummed guitars, supplementing the musical offerings of a hard-working phonograph. At the Arrowrock dam in Idaho a club room is open from 8 a.m. to 10 p.m. every day in the month, and the entertainment comprises local talent, moving pictures, lectures and a religious meeting once a week. The Elephant Butte camp has a moving picture theatre under government management which pays its own expenses and aids greatly in keeping the men satisfied with camp life. These camps are famed among contractors.

The incidents cited leave no doubt that contractors, always alive to economies in the operation of equipment, are realizing more and more each year that the same measure of consideration is to be given to the human factor. Nevertheless it is probably safe to say that among those handling jobs of moderate size the ideas as to sanitation, housing and recreation above brought out have not found so ready acceptance as among the larger contractors. That the advantages would be proportionately as great on the smaller jobs is reasonably certain, and without doubt an investigation of these advantages by the smaller contractors would result in a more rapid spread of these modern ideas in the running of construction camps.

The Inspection of Municipal Work

THE necessity of having competent and honest inspectors upon any work during its construction has long been considered one of the most important factors in the success of an undertaking. The realization thereof, however, has rested more with the contractor, from his own standpoint, than with the municipality. So that it is interesting to find in Mr. Samuel Whinery's new work on Specifications, reviewed in another column, special emphasis laid upon the matter, in a code of instructions for inspectors. The case is presented in the interests of the municipality and as such the following extract should merit the perusal of municipal engineers:

Where the contractor is incompetent, careless or unreliable, inspection is absolutely necessary if good work is to be secured, observes the author. Even where the contractor thoroughly understands his business and intends to faithfully comply with the specifications and to do all his work in a proper manner, the inspector cannot safely be dispensed with. The contractor cannot at all times be on the work. Whatever may be his intention and instructions, foremen and laborers cannot be depended upon to exercise the proper care and judgment, even where they have no inclination, motive or interest to do otherwise, which is not always the case. It seems to be deeply and almost irradicably fixed in the mind of the average foreman on municipal work that he is expected to show his ability and skill by evading or circumventing the strict requirements of the specifications and the watchfulness of the municipal agents, whatever his employer may say to the contrary. Even when fairly careful, honest and conscientious he may need friendly oversight. He is naturally and properly anxious to save all the money he can for his employer, whether from a desire to loyally serve that employer's interest, or to enhance his reputation for doing work cheaply. He may not appreciate the importance of minor requirements of the specifications and may believe they can be ignored without real detriment to the utility of the completed work. Like other men he may sometimes be careless or forgetful, however good his intentions.

These human qualities are not confined to foremen on contract work. They are liable if not likely to be found in the foremen on work done for the municipality by the direct, or day's work system. They may be encouraged by the impression or belief that they will not be held by the municipal authorities to as strict an observance or accountability as they would be if the work were being done by a contractor—which is too often true. The absence of some of the motives of foremen employed by contractors is, therefore, not a sufficient reason for dispensing with inspectors on work done by the city direct.

It should be trite to say that inspectors should be chosen with some regard to their qualifications for the work they are expected to do. One cannot, of course, expect to secure experts for such positions at the rate of compensation usually paid; but it is reasonable to require that an appointee to such positions shall possess the following qualifications: that he shall be honest, trustworthy and loyal; that he shall be a man of at least average intelligence and common sense; that he shall have some practical knowledge of or experience in the work he is employed to inspect; that he shall be a man of good personal habits; that he shall be habitually punctual, industrious, and alert, and possess a fair share of that quality commonly called "backbone."

It will not, I am sure, be denied that a very large number of the inspectors found upon municipal public work fall short in one or more of these qualifications.

Inspectors who habitually expect or accept compensation or gratuities from the contractor violate the first requirement, and their number is astonishingly large. These are useless, or worse than useless, to the municipality. There are not a few contractors who will take advantage of the presence on the work of such inspectors to do things that they would not do if thrown wholly on their own honor and responsibility. Contractors can hardly be blamed for expecting some compensation for the money thus exacted or accepted by the inspector from them.

The requirement that the appointee shall have some practical knowledge of and experience in the work he is expected to do, while often disregarded, is of real importance. Good workmanship embraces many small details that are essential, and inferable from the specifications, but cannot be stated at length therein, and the inspector should have a good working knowledge of these.

Unfortunately, large numbers of inspectors are employed for personal or political reasons, or because more competent men are not available. They know little or nothing from practical knowledge and experience about the work they are assigned to inspect. Efficient service cannot be expected from such, even if they possess the other necessary qualifications. The obvious remedy, where a sufficient number of qualified inspectors cannot be obtained at call, would be to train up a permanent force by having the promising tyros serve a sufficient apprenticeship under older and more experienced inspectors; but this is seldom done.

Inspectors, whether appointed by the engineer in charge or not, should be absolutely under his control, including the power of dismissal without unnecessary formalities. Where they are under civil service regulations and can be dismissed only upon charges and after a hearing before some third person, the obstacles in the way of promptly getting rid of an incompetent or unfaithful inspector are often so great as to be discouraging if not deterrent. He may be clearly below a reasonable standard of honesty or efficiency but it may be very difficult to formulate distinct charges and support them with positive evidence. Thus, one may be morally certain that an inspector is accepting gratuities from a contractor, but unable to prove it by legal evidence. If in such cases this judgment and integrity of the responsible engineer cannot be trusted. He himself, is not fit for the position he occupies.

The question of how much authority and power shall be given to the inspector is always a troublesome one. If he be too much limited or restricted, he cannot properly discharge his duties or command the necessary respect from the contractor and his employees. If he be given too much authority and is disposed to be arbitrary or unreasonable, the contractor may be unjustly treated. So far as the definite requirements of the specifications are concerned there can usually be no room for going astray, but in the numberless little details not specifically covered in the specifications, or where their language and intent is not clear, differences and disputes may result which require a degree of knowledge and judgment that the inspector may not possess, and where his decisions might be against the interests of the municipality or unjust to the contractor. In such cases the matter should always be referred to the engineer or his assistant.

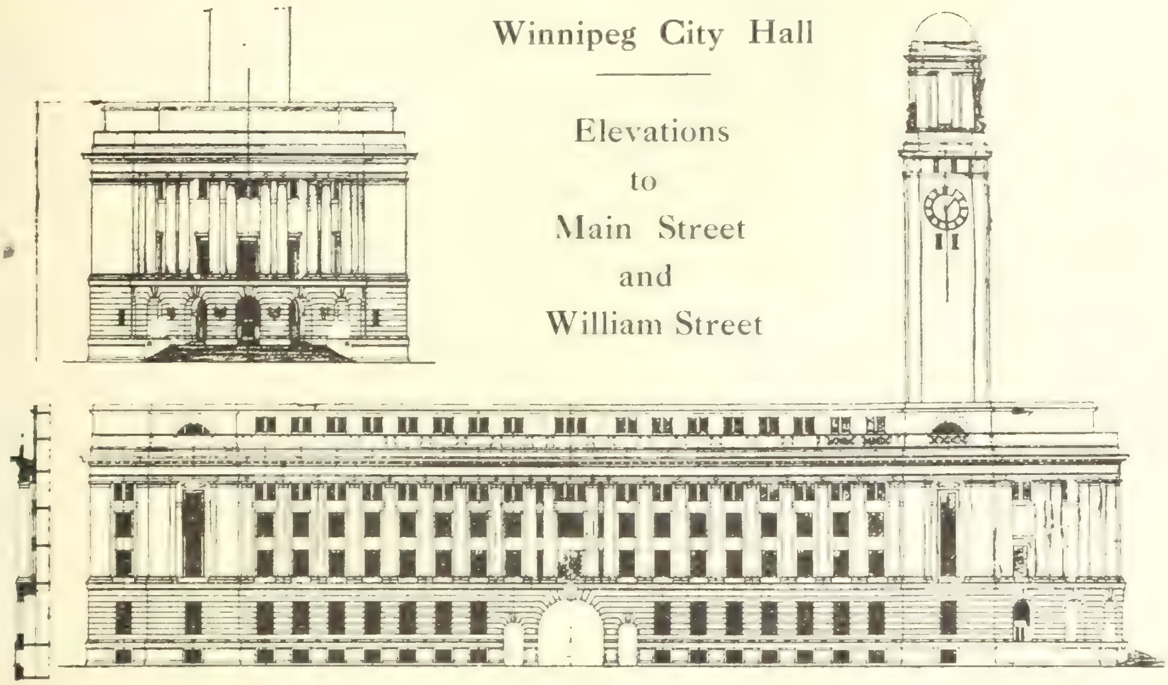
Where inspectors are employed upon work done directly by the municipality, the relation between them and the superintendent or foreman should be clearly defined and understood. Briefly stated, this relation should be the same as that between the inspector and the contractor on contract work.

High bearing capacity was developed by wooden piles from 30 to 65 ft. long driven in blue clay for the foundations of the west piers of the Superior avenue viaduct, Cleveland. Mr. B. F. Morse states, in the last issue of the "Journal" of the Cleveland Engineering Society, that the piles were driven from 2 to 3 ft. apart, or less on centers, with an average penetration of 5 in. under the last blow. They sustain a permanent load of more than 20 tons each in some cases, or over 5 tons per square foot of foundation area. After four years' service the piles had settled only from ½ to ⅝ in. Similar piles, driven into a deep stratum of sand, silt and mud in varying proportions, had an average penetration of 3 in. under the last blow, and settled about the same amount.

Accepted Design for the Winnipeg City Hall

On the opposite page there are reproduced the elevations submitted by Messrs. Clemesha & Portnall, of Regina, for the new City Hall at Winnipeg. Mr. Leonard Stokes, F.R.I.B.A., was the assessor in this competition, which was confined to British architects. Thirty-nine designs were submitted. The site is an island one facing William on the south-east with Market street on the northern flank. The apsidal portico towards the east fronts Main street, which is the most important thoroughfare. The archways leading into the central open court, which makes so distinctive a feature in this capable scheme, face the ends of two cross roads, known hitherto as King street, which is thus bisected by the new building. To the right hand of this cortile, in the middle of the building, are located, on the ground floor, the city treasurer and the light and power departments, the central public space being top-lit, with colonnades round, and aisles beyond, which add greatly to the internal effect, as will be seen by the section. To the left, the same treatment is repeated for the tax department. Four well-lighted staircases are provided, one situate at each external corner of the building, and leading up to the council chamber, which is placed at the Main street end of the premises, over the semicircular entrance hall. Close by, on this main floor plan, is the banquet and conference hall to the south, and private offices and committee rooms on the north. A members' smoking room and toilet conveniences look into the eastern open court. At the other end of the block are located the greater and lesser courts, with magistrates', witnesses', and other rooms. In the middle of the north flank the board room is situate, with pay offices adjoining. The city clerk's general office is on the southern side, with private and other rooms, a continuous corridor running round the whole building; and this is exceedingly well lighted. The typical plan, of which there are five stages, is here illustrated. These have their main spaces fronting all four elevations, and are intentionally left undivided, so that the allocation of the areas thus provided may be determined when the exigencies of the various official departments are actually ascertained. This appears to be a wise provision, and the architects have so spaced their fenestration as to permit quite readily of almost any division of space which necessity may demand. There are public lavatories in the basement at the Main street entrance end. The principal side and end positions are devoted to the departments of sanitary inspectors, museum of hygiene, disinfection, food and dairy division, and medical health. The heating chamber is in the middle, under the open courtyard which forms a thoroughfare through the new building. The cost contemplated is $3,000,000. The first premium was $5,000.

It is reported that the contract for the construction of fifty-seven miles of line from Otter summit to Hope, B.C., which will be used jointly by the Kettle Valley and Great Northern Railways, will be let in the next few days. It is likely that Grant, Smith & Company, Henry Building, Seattle, who built forty miles of the Canadian Northern through the Fraser canyon, will be the successful tenderers. The contract will amount to about $3,500,000.

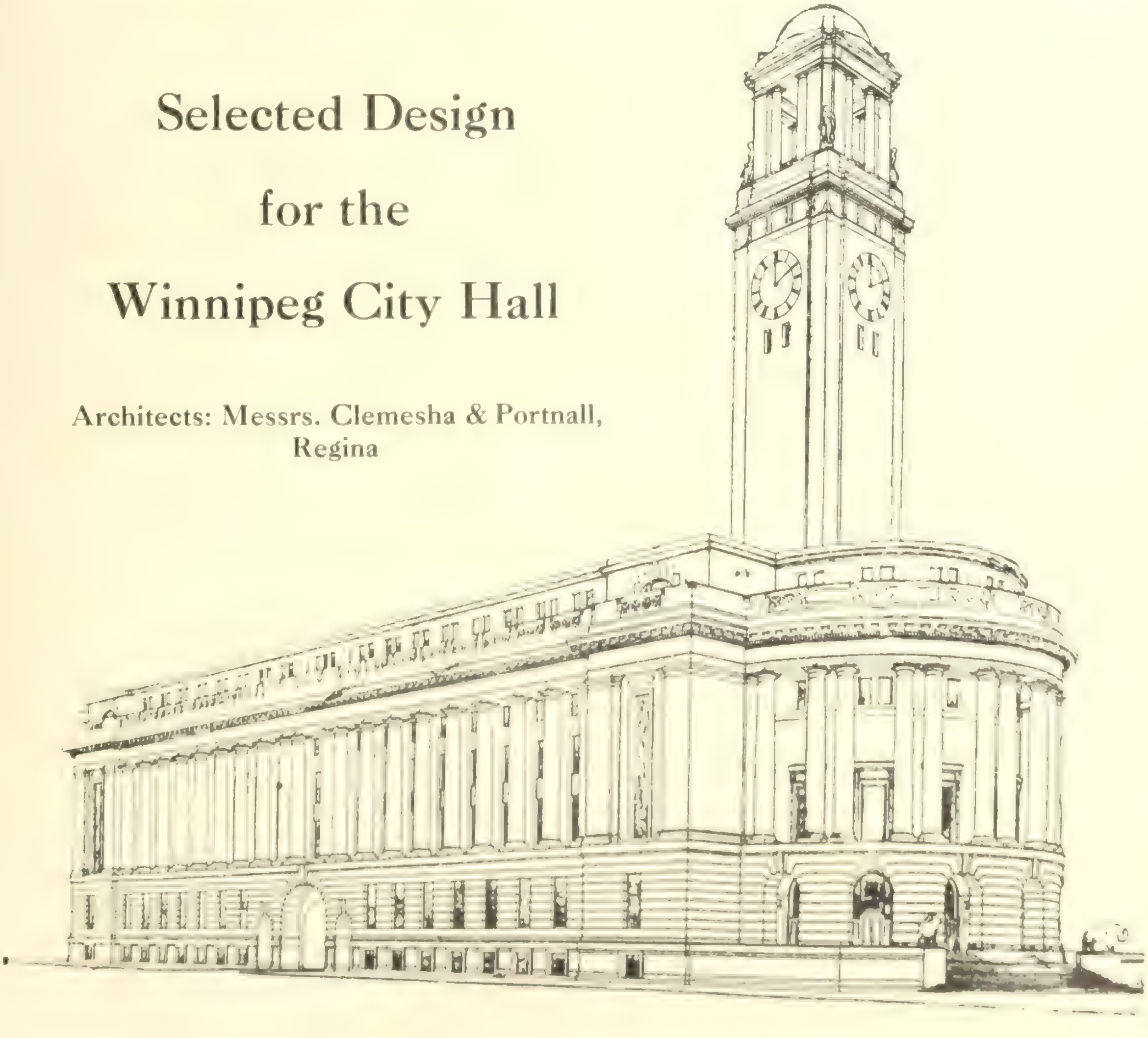


Winnipeg City Hall

Elevations
to
Main Street
and
William Street

Selected Design for the Winnipeg City Hall

Architects: Messrs. Clemesha & Portnall,
Regina



The Fundamentals of Concrete Design

A Brief, Practical Consideration of the Essentials of Design and the Requirements of Reliability—Advantages and Limitations of the Material

By Professor E. Brown, Department of Civil Engineering, McGill University, Montreal.

CONCRETE construction has many followers, ranging from the rabid enthusiast who will assert that it is the thing for almost every kind of building, to the more modest and perhaps more effective advocate who realizes at one and the same time its advantages and its limitations. There was a day when it had its opponents; but its record of actual achievement in the past few years has established its claim to being one of the principal forms of construction at the present day. The opponents have become friendly critics or even converts, and I imagine there are now very few who are so blind as to ignore the facts of the situation.

There are, however, some who seem to think that a designer in reinforced concrete is drawing on his imagination (shall I say) to a much greater extent than a designer of steel work. Some steel designers—at all events until recently—would almost give you the impression that their work was calculated to such a nicety as compared with that possible in reinforced concrete work, that the latter comparison had very little claim to exactitude. I am not here advocating one form of construction as against another, nor any particular type of either form; but I do say that if we set down the exact conditions of the problem confronting a designer in these rival forms of construction, there is not much to choose in the matter of exactitude. I am not here concerned with any considerations of actual construction. We can have good and bad work in any kind of construction. I am speaking of the conditions of design. The problem is always this, no matter whether it is a design for a huge bridge or for an office building or store:

Problems of Design

1. To make some estimate, more or less exact, of the forces which will probably be brought to bear on the structure considered—floor loads, wind loads, etc.
2. By some theory, more or less exact, to determine the forces which the above estimated loads will produce in the component parts of the structure.
3. From our knowledge, more or less exact, of the physical characteristics of the materials employed in the various parts of the structure, to proportion those parts so that they may withstand successfully, for an indefinite period, the forces which are estimated to come upon them.

After that, it is necessary to have the work carried out in strict conformity to the designers, by efficient labor, under the best supervision. In the matter of the first two processes above designers of steel work and of reinforced concrete work are on the same footing.

As regards the third point, our knowledge of the properties of concrete and of the effects of changes in its composition, is of considerable extent; and I do not think that a conservative designer need have any anxiety in regard to the behavior of his structure if reasonable, sound specifications are lived up to. Steel designers, in recent years, have come to consider much more carefully than heretofore the probable effects of eccentricity in some of their details; and in this, reinforced concrete designers can learn from them. In the particular case of columns consisting of angle and other sections latticed and tied together, we are only in the early stage of finding out how they really act. I could show you experimentally the actual conditions of stress in such a member as a tie-bar made up of two angles back to back, connected by a plate at their ends, and separated at intervals by distance pieces—one of the commonest forms of construction imaginable. Experiments of a very interesting character are being made by one of our staff at McGill on this matter; and all I need say to emphasize the point I am now making, is that any steel designer who thinks that even such a simple built-up member acts as one piece has another "think" coming to him. No, gentlemen, we are all engaged in "estimating" something. Formulae expressing the complex action which is going on either in a steel structure or in one of reinforced concrete, may be forthcoming; but of this I have grave doubts, and, even if they are, we shall, for practical purposes, make such modifications of them as will eliminate from them any complexities that are due to effects which are either of small magnitude or which can be allowed for in a simpler manner.

A survey of the development of our professional work generally will show that wherever and in so far as it has been possible to exalt any branch of that work to the rank of a science, the progress has been due to the gradual but certain development of a few fundamental ideas. Our great electrical industries of to-day have developed by application of the great principle discovered by Faraday when he found that a closed coil of wire moved across a magnetic field generated an electric current. And while few of our branches of engineering science are as scientifically exact as the one I have just mentioned, in all or most of them there is such a mass of practical experience and of results of tests to couple with some simple fundamental ideas expressing actual conditions but inadequately, that we can go ahead with our designs with complete confidence in the results. The science of hydraulics is an instance of this phase of the work of our profession.

So that while I, for one, should not be prepared to admit that the steel designer can figure the actualities to a much finer degree of accuracy than the reinforced concrete designer, I do think that the latter depends to a tremendous extent on the honesty and sincerity with which his plans are carried out. Structural mild steel is manufactured in our steel mills under reasonably uniform conditions; and speaking broadly, of course, an engineer buys it in the open market with considerable confidence in its physical properties. He knows that he can figure safely on 16,000 pounds per square inch in tension, and that if he is cutting his sections as finely as possible, he may reduce them by say 10 per cent., and increase his unit-stress accordingly. The properties of his material are not altered. **He is not taking an unknown risk.**

But in concrete construction the material by which the compressive forces in the structure are carried is made and laid on the spot, and is liable to such variations in mixing as may occur in practice, quite apart from any variations in quality due to change of composition. If we reduce cement by, say, 10 per cent., use an inferior sand, or change the nature of the aggregate without definite knowledge of the effects of this change—if we do all or any of these things, we are altering to an uncertain extent the physical properties of our concrete. **We are taking an unknown risk,** and one which to my mind is entirely different in character from that involved in a cut of a definite per cent. on steel sections.

We know from experience that certain expectations in the properties of mild steel will almost certainly be lived up to; and it is in the power of those engaged in reinforced concrete work to produce a concrete equally uniform and reliable. A successful designer has always in mind certain possible differences between assumed and actual conditions; and it is in a proper realization of such differences, and in the capacity of the designer to appreciate the extent of their influence, that reliance must be placed. If, for any reason, he may fear that the concrete will stand a compression stress of only 400 pounds per square inch, instead of perhaps 600 pounds, his opportunities to make both a successful and an economical design are at once limited. Poor concrete is much the same weight per cubic foot as good concrete; and if the concrete is poor, and capable of safely carrying only a small compressive stress, more is required to sustain a given compression load, and hence more steel is required to carry the extra dead load necessitated.

Fundamental Theory

Any theory of reinforced beams starts from the assumption that the several layers of the beam are lengthened or shortened by an amount proportional to their distance from the plane separating tension and compression areas. Careful experiment shows while this is not rigidly true in all cases, it is conformed to with reasonable accuracy in most cases. Accepting it as true, we shall get different results for the bending moment which the beam can carry, according as we assume:

(a) Variable modulus following assigned law.
(b) Modulus uniform during loading.
(c) Different values for the uniform modulus.

Assume a rectangular beam 10 inches deep, with, say, one per cent. reinforcement. Then, taking average concrete, one should find that under working loads the distance from the steel line to the point in the section where the resulting compression acts, is about:

8 feet 6 inches if we assume a variable modulus with the definite law of variation;

8 feet 8 inches if we assume a uniform modulus of 3×10^6 pounds per square inch.

The safe bending moment on the beam is the product of the allowable force in the steel and one or other of the above numbers. It is evident that the difference shown in the safe bending moments is only some 2½ per cent., and any attempt to figure to such a degree of supposed accuracy is foolish. Rods, in practice, may easily be displaced by an amount affecting strength calculations far more than do these different theories.

These figures neglect concrete tension, and their differences indicate the extent to which different methods of calculation affect the broad features of design. Under the specifications adopted by the American Society for Testing Materials, the American Society of Civil Engineers, and the Maintenance of Way Association, all concrete is now taken to have the same modulus—a great change since the days when cinder concrete, rock concrete, gravel concrete, etc., were all supposed to have a different modulus, following a different law of variation as the load increased. It has been amply demonstrated that all these were unnecessary refinements, and the Standard Specifications recently drawn up have swept them away. Similar simple specifications were drawn up earlier by the Royal Institute of British Architects, and I would urge the adoption of some such standards here. I do not believe you have any such standards at present. When in Toronto a couple of years ago attending the Cement Association Congress, I learned that their building bylaws prohibited a designer from figuring any continuity in reinforced concrete floor system, and I believe that foolish and unjustifiable prohibition still stands. It seems to me to eliminate competition to a great extent, and to leave a clear field for the steel construction. Here, in Montreal, I do not think you are hampered by any bylaws on such matters—it is more of a go as you please. You are more familiar than I can be with the results of this; but unless something miraculous happens, the usual result of such conditions is to find one design called for according to one set of specifications, another design according to another set, and so on. Now, even if all these varied specifications are beyond reasonable criticism—which is questionable—would it not be better to have a working standard? Our railroad bridges and highway bridges are built under standard specifications, and it seems to me desirable that there should be some standards in this matter also. I am sure it would be advantageous to have something of the kind, whether the architect prepares the plans in his own office or has them prepared independently by an outside firm.

A three-span through-plate-girder bridge carrying tracks of the Elgin, Joliet & Eastern Railway over the Chicago & Alton Railway, near Joliet, Ill., was recently replaced without interrupting traffic by a similar new bridge with two 30-ft. spans and one 40-ft. span. The new structure was erected alongside the old one on false work towers seated on 12 freight car trucks, located on four temporary tracks transverse to the bridge axis on the surface of the ground on both sides of the Chicago & Alton tracks. After the new structure was completed, the weight of the old structure was jacked up clear of its original bearing and its weight transferred to the false work. Both old and new structures were securely clamped together, the track was cut and in an interval between trains both structures were moved transversely to the bridge axis until the new one replaced the old one and was lowered to permanent bearing on the masonry. The bridges were moved by a tackle at each end operated by the hoisting engines of derrick cars on the overhead tracks at both ends of the bridge. The new bridge was substituted for the old one and ready for the resumption of traffic in 1 hour and 4 minutes.

A model theatre has been built at Dusseldorf, in order to test the dangers of theatre fires, and the best means of rendering theatrical buildings proof against fire. It occupies a site measuring 50 ft. by 80 ft., with the auditorium 30 ft. and the proscenium 40 ft. high. The main part of the building is of steel and ferro-concrete. A special entry enables observations to be made both in the front and the rear, and two kinds of fireproof curtains will be fitted.

Motor-Operated Railroad Lift Bridges

TWO interesting installations of motor operated railroad bridges are those that carry the six tracks of the Harlam River Branch of the New York, New Haven and Hartford Railroad over the Bronx and the Hutchinson Rivers and over which approximately two hundred trains pass daily. These bridges have been in successful operation now for several years.

Each bridge is made up of three leaves. Each leaf carries two of the six tracks. The Bronz River bridge (numbered 3.40) is near the Westchester avenue station. The Hutchinson River bridge (numbered 7.73) is between the Baychester and Bartow stations. Both are the Scherzer type of rolling lift bridges.

Since the channels spanned by these bridges are only about 100 feet wide, the rolling lift construction was adopted, because this type requires no centre pier and involves no obstruction or widening of the channell. Fig. 1 shows the three leaves of bridge 3.40 open, and Fig. 2 a detail of the "ways" upon which one leaf rolls; bridge 7.70 is similar in construction. The number of daily openings varies, averaging five in the case of bridge 3.40 during winter months and twelve during other months. The number of openings of bridge 7.73 is less.

Each leaf is operated by two Westinghouse 25 h.p. 550-volt, direct current motors mounted on the moving leaf and geared to pinions which project from the side and mesh with racks on the stationary part of the bridge. Under ordinary circumstances the two motors on each leaf are operated together as one unit, but either can be controlled separately and either has sufficient capacity to move its leaf, although of course more slowly than if the two motors are working together. Both motors are provided with an electric brake and each leaf has a separate emergency brake.

The motors, brakes, and other apparatus on the bridge itself are weatherproof, and are designed for successful operation through an angle of 90 degrees, through which angle the bridge moves vertically. The conduit carrying the current to the moving part of the bridge can be seen near the lower left-hand side of Fig. 2, passing to the upper side of the roll-way, and (when the bridge is open, as shown) lying along a trench to the point where the conduit is carried up into the bridge itself. As the bridge swings down, the point where the cables enter the leaf moves upward, and the slack cable rises out of the trench.

The bridge is controlled from a tower. To open the bridge the signals are first set against trains, derails are opened, and bridge rail lock mechanisms are released. Until these steps are taken, it is impossible to open the bridge. The controllers are then operated and the upward movement of the bridge begins. At four points in its travel, signal lamps are lighted and bells are rung. If the power is not shut off when the leaves are at the proper height, a circuit breaker is tripped automatically. When the bridge is open, the navigation lights on the river change from red to green.

The leaves are arranged in case of emergency to be manually operated by means of an endless chain over a wheel on the counter shaft. Considerable time is required for this and it has never been necessary since either of the bridges were put into service.

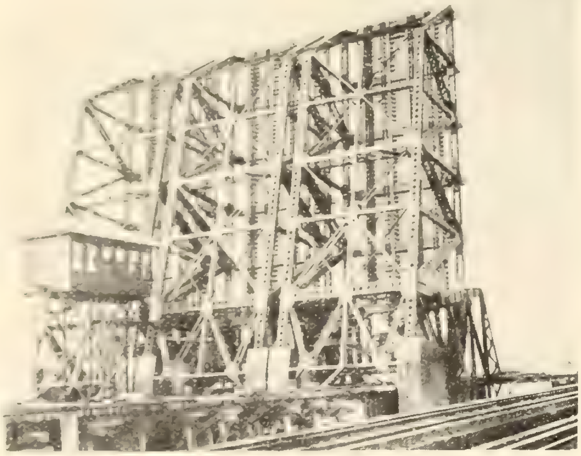


Fig. 1.—Scherzer roller lift bridge for New York, New Haven and Hartford Railroad, over the Bronx River.

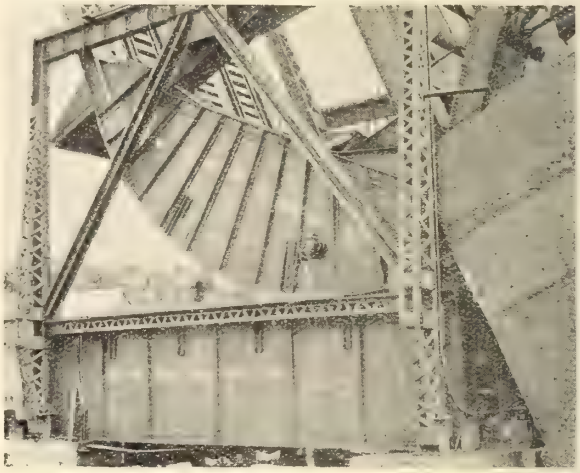


Fig. 2.—Detail of bridge, showing method of conveying conductors to moving parts.

Dynamite in cold weather requires to be handled carefully and intelligently if accidents are to be avoided. When dynamite is frozen during shipment from a factory to a mine and is immediately taken down into the tunnel to thaw out moisture from the humid air below the surface deposits on the explosive in large quantities. According to an article in the "Mining and Scientific World" by Mr. F. H. Gunsolus, sufficient moisture enters the dynamite to lower its sensitiveness and to cause misfires, blow-outs and burned-up charges. This condition is said to apply also to blasting caps, which are even more susceptible to moisture than the high explosives. The remedy suggested is to keep the dynamite on the surface long enough for it to warm up. Underground storage of blasting caps is not recommended by Mr. Gunsolus. In thawing dynamite it is much better to warm it gradually for several days at a temperature of 70 or 80 deg. Fahr. than to attempt to thaw it quickly at a temperature of 100 deg.

The sixth annual banquet of the board of managers of the Atlas Portland Cement Company Relief and Beneficial Association was held recently at the new American Hotel at Bath, Pa. The association has been giving aid to its members, when it is necessary, and paying death benefits for the past six years and has never had less than $4,000 in the treasury, and at present has a surplus of $6,818.04.

Problems of Storm Water Discharge

In the following article, Mr. R. A. Wynne-Roberts, M. Inst. C.E., Consulting Engineer, Regina, and Mr. T. Brockmann, Dipl. Ing. (Berlin), Civil Engineer, Regina, offer their combined experience in the solution of problems arising out of Storm Water Discharge. The subject is discussed in all its phases. Having regard to the variable factors encountered, the drawing of flow areas is established as a satisfactory solution. In their recapitulation, the authors lay down the following directions for the engineer: (1) Assume the intensity of the rainfall. (2) Ascertain if retardation takes place. (3) If retardation does not take place, then use formula. (4) If retardation does take place, then draw flow-areas. The complete example given at the end of the article should be found most valuable in practice. The articles were presented last month in serial form by our London contemporary, The Surveyor, and are now reproduced here en bloc, with the illustrations redrawn for this journal.

Mr. Symons, in 1878, observed a precipitation in Camden Town, London, England, falling at the rate of 12 in. per hour, continuing for 30 seconds (Moore). In the Central States of America a rate of 3.7 in. for 10 minutes, 2.8 in. for 20 minutes, 2.3 in. for 30 minutes, and 1.7 in. in 60 minutes may be expected (Folwell).

The following are a few recorded examples of the intensity of rainfall. Those recorded in Toronto were kindly supplied by Prof. Stupart, the director of the Meteorological Service.

Year.	Place.	Duration of storm in mins.	Actual rainfall recorded, ins.	Rate of rainfall, ins. per hour.
1905	Ponder's End, England	18	1·05	3·82
1906	Birmingham, England...	27	1·04	2·31
1905	Birmingham, England ..	7½	0·56	4·50
1906	Burnham, England	40	1·73	2·60
1908	Guildford, England	8	0·87	6·68
1907	Worcester, England	8	0·43	3·22
1905	Wallington, England .	65	2·77	2·55
1869 1891	New York, U.S.	10	1·20	7·20
1871 1891	Washington, D.C. .	6	0·80	9·60
1905	Washington, D.C.	78	3·11	2·39
1884 1891	Philadelphia, Pa.	20	1·60	4·80
	Brooklyn .	25	2·60	6·24
1890	Frankfort, Germany	6	0·40	4·00
1890	Frankfort, Germany	4	0·267	4·00
1891	Frankfort, Germany ...	6	0·47	4·70
1890	Frankfort, Germany .	7	0·55	4·70
1902	Toronto, Ontario	5	0·11	1·32
1903	Toronto, Ontario	15	0·60	2·40
1903	Toronto, Ontario	5	0·40	4·80
1904	Toronto, Ontario	7	0·28	2·40
1904	Toronto, Ontario	10	0·51	3·06
1904	Toronto, Ontario	8	[illegible]	4·80
1905	Toronto, Ontario	7	0·32	2·81
1905	Toronto, Ontario	5	0·25	3·00
1906	Toronto, Ontario	7	0·53	4·56
1907	Toronto, Ontario	5	0·25	3·00
1911	Toronto, Ontario ..	7	0·54	4·63
1912	Toronto, Ontario	5	0·25	3·00
1912	Almasippi, Manitoba ...	90	0·75	0·50
1912	Crescent Lake, Sask. ...	30	0·48	0·96
1912	Bardo, Alta.	60	1·20	1·20
1912	Delia, Alta.	15	1·20	1·60
[illegible]	Chicago, Ill.	7	0·97	8·30

It is unfortunate that there is comparatively little information available as to the intensity of rainfall in different parts of various countries. Still, the records suffice to show that the maximum intensity ordinarily lasts only for a few minutes, sometimes at the commencement of a storm, other times in the middle or at the end of it. Furthermore, the area of maximum intensity is usually circumscribed, and often located in different parts of a district.

It frequently occurs that after a prolonged drought rainfalls of great intensity are experienced. Sometimes it happens that during long periods of wet weather, when the surface is already saturated, and the sewers are flowing practically full, a rainfall of greater intensity will fall and thus give rise to floods, unless the sewers are of more than ordinary capacity. If records of rainfall in wet districts are carefully studied, it will doubtless be found that the intensity is relatively lower there in comparison with drier districts.

Fig. 1 shows two curves illustrating rainfall intensity. Curve I. represents moderate amounts of rainfall observed at Edgbaston, Birmingham, England. This curve is a copy of one prepared by Mr. Wallington Butt, who stated that it is more or less applicable to other parts of England, and by it stormwater discharges can be estimated in that country. Curve II. represents the mean highest rainfalls observed in Germany, and this generally constitutes the maximum intensity assumed in that country.

Both curves serve to show that the intensity of a rainfall varies inversely with the duration of the storm. For example, a rainfall of 20 minutes' duration has an equivalent intensity of 1 cu. ft. per second-acre in Birmingham, and 1.73 cu. ft. per second-acre in Germany, while a 10 minutes' rainfall has an intensity of 1.33 and 2.36 cu. ft. per second-acre respectively.

Although the foregoing diagram will be found useful as a graphical method of ascertaining the factor of rainfall intensity with sufficient accuracy, it will doubtless be acknowledged that it is highly desirable to ascertain the intensity in any particular district by means of reliable automatic recording rain gauges, of which the simplest is usually the best.

In countries where a considerable accumulation of snow takes place, such as in Canada, and this melts in springtime, it is a matter of great importance to give this point careful thought, for it often occurs that rain falls when the temperature rises, and this causes serious floods. No statistics are at present available on this feature of our inquiry, so it must be left for the reader to bear it in mind when undertaking investigations.

In addition to ascertaining the rainfall intensity in any district, it is practically certain that it will not be of uniform intensity throughout that area, especially if the area is at all extensive. An interesting example of this is referred to by Sir Maurice Fitzmaurice, who, when discussing Mr. Lloyd-Davies' paper, remarked that very heavy showers were extremely local in character, and mentioned a case where rain falling heavily at Hampstead caused a sewer at King's Cross, London, to be gorged and some lives to be lost, although, where the men were working, no rain had fallen. The distance between the two places is only about three miles.

Careful observations have been made, in Germany, for instance, and it was found that the mean intensity of rainfall became less as the drainage area increased in size, or the sewers increased in length, beyond a certain radius from the point of heavy rainfall.

It may be stated that observations were made in Breslau, Germany, on an area of about 1,700 acres to ascertain [illegible] intensity at three stations located as far apart as possible, and it was found that during a period of 760 minutes rain fell simultaneously for only 90 minutes at two stations, and at the three stations for only 28 minutes. In view of these facts, it was not justifiable to assume a uniform intensity over a large area. Further investigations were therefore instituted, so as to ascertain in what manner the maximum intensity qr varied, with the result that it was found that the intensity diminished to qr/2, in a distance of about 10,000 ft. from the point of observation.

It may be objected that it is too unfavorable to base a conclusion on such a limited number of instances, where rain fell on all three or two stations at the same time, and to ignore the larger number of rainfalls which occurred at solitary stations. It is submitted, however, that such precaution is justified by the limited extent of the observations, by their local character, and by the fact that storms are not stationary, but travel in different directions, sometimes across a district, sometimes diagonally, and at other times along the major axis of the drainage area; in the latter case, a proportionately larger quantity of storm water will naturally have been precipitated and have to be dealt with.

It may also be contended that it would be more accurate to take, instead of the length of 10,000 feet, a value depending directly on the intensity, for as the area decreases the intensity increases. The results of the observations, however, are not sufficient to ascertain, with any degree of accuracy, the relation which subsists between the intensity of a rainfall and the area; and, moreover, those downpours taken into consideration have some features in common in the manner of occurrence, and do not differ very much in their intensity.

For the sake of simplicity, it may be assumed that the curve representing the decrease from the maximum intensity qr to that at the remote part of a district, qr/2, is that of a parabola, so that the intensity and extent of any storm are represented by a solid of revolution, generated by the revolution of a parabola along its axis, and a section along this axis will therefore be, as shown in Fig. 2, at M, A, N, O, P, being limited on the top by two parabolas. The ratio between the solid of revolution and a cylinder representing a uniform rainfall, then, will give the coefficient I, by which the highest intensity assumed has to be multiplied so as to obtain the average intensity of storm, and this factor is called the "coefficient of intensity."

Let A be the zero point, then the parameter p is found from $10{,}000 \times p = \frac{(qr)^2}{2}$ or p equals $\frac{qr^2}{40{,}000}$; the equation of the parabola will be $y^2 = \frac{qr^2 \times x}{40{,}000}$

The circumference described by the centre of gravity in revolving is $2 \times 0.6 \times x \times \pi$; therefore the content of the solid of revolution corresponding to the shaded area (cylinder minus parabola) is—

$$x^2\pi qr - 2/3xy1{,}2x\pi = x^2\pi\,(qr - 0{,}8y),$$

$$\text{and } I = \frac{x^2\pi\,(qr - 0{,}8y)}{x^2\pi qr} = 1 - 0{,}8\,\frac{y}{qr}.$$

......

$$\text{As } \frac{y}{qr} = \sqrt{\frac{x}{40{,}000}}, \quad I = 1 - \frac{0{,}8\sqrt{z}}{\sqrt{40{,}000}}$$

The downpour will yield the maximum storm if A is located in the centre of the drainage area, and then x may be assumed to be equal to one-half of the length of the sewer, and it will be—

$$I = 1 - 0.0028\ \sqrt{L}$$

L is the length of the sewer in feet.

If qr be taken equal to y, then from the equation of the parabola the values x equals 40,000 ft., and L equal to 2x, equal to 80,000 ft., will be obtained. This, therefore, is the limit of the application of the above equation, and obviously

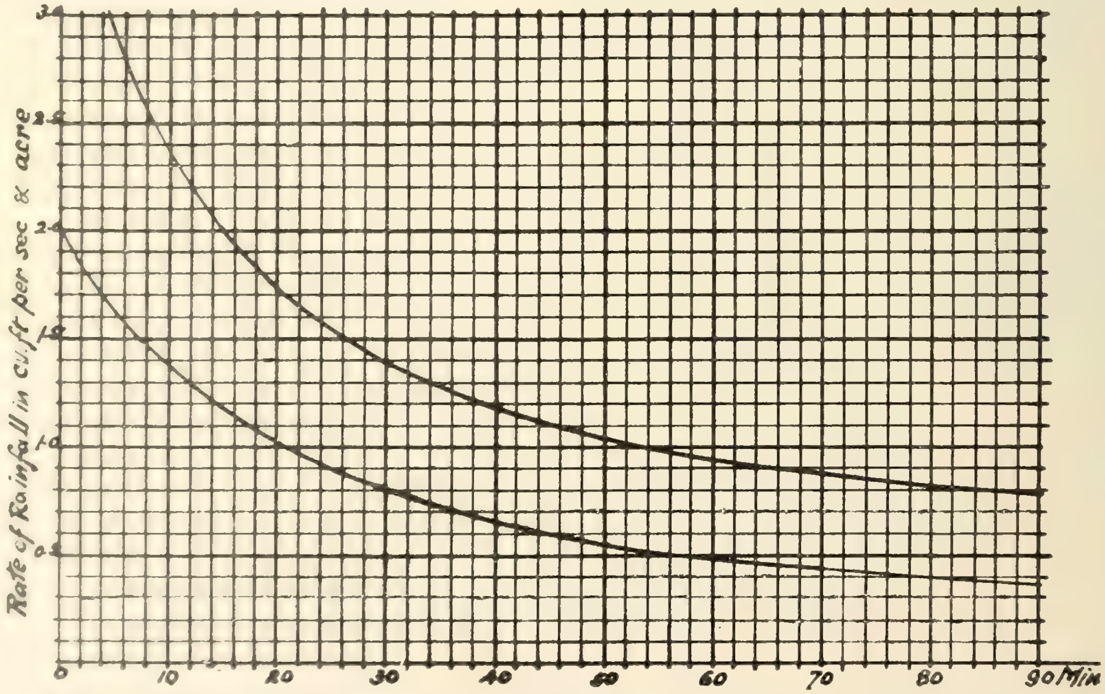


Fig. 1.—Rainfall intensity curves. (Curve I. represents all moderate amounts of rainfall in Birmingham; Curve II. covers the mean heaviest rainfalls in Germany.)

this limit will accordingly not be attained, even in the case of very extended sewerage systems.

The following table will give the coefficients of intensity ascertained by means of the foregoing formula:—

$I = 1 - 0.0028 \sqrt{L}$:—

L in feet	Coefficient of intensity	L in feet	Coefficient of intensity
500	.937	5,000	.802
750	.923	5,500	.793
1,000	.9115	6,000	.782
1,250	.900	7,000	.766
1,500	.892	7,500	.758
1,750	.883	8,000	.750
2,000	.875	9,000	.733
2,500	.860	10,000	.720
3,000	.847	12,000	.692
3,500	.835	15,000	.660
4,000	.823	20,000	.605
4,500	.813		

Fig. 3 has been prepared to give the above information.

As an explanation of the foregoing table and diagram, it may be stated that if the calculations in connection with a proposed sewerage system are based upon a high rainfall intensity of, say, 1.428 cu. ft. per second-acre, the sewer being, say, 1,650 ft. long, the coefficient for which in the above table and diagram is 0.89, then 1.428 × 0.89 = 1.271 cu. ft. per second-acre, which is the intensity to be provided for when designing the sewers.

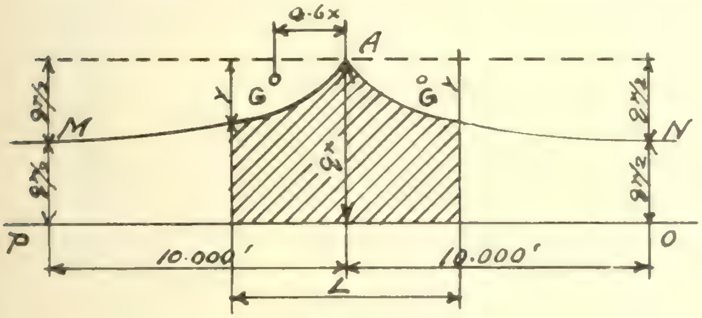


Fig. 2

It will be observed that it is necessary in this connection to reduce the rainfall which is measured in inches depth to cubic feet per second-acre. As 1 in. of rain per hour on 1 acre is practically equal to 1 cu. ft. per second-acre, it will be a simple matter to make the conversion.

Thus 1 inch of rain per hour equals 1 cubic foot per sec-acre.
0.5 in. of rain per hour equals 0.5 cubic foot per sec.-acre.
0.1 in. of rain per hour equals 0.1 cubic foot per sec.-acre.
and so on.

It is palpable that rain falling on the surface of the earth will be absorbed in some proportion to the permeability of soil, etc. Very little rain will run off sandy ground, but if the ground is hard clay or close-grained rock more will flow over the surface and be drained away. If the ground is already saturated, most of any rain falling upon it will flow off by gravitation to the lowest point. In the case of intense rainfall the ground is unable to absorb the same proportion of water as it would if the rain fell in gentle showers, and consequently a larger percentage of it is drained away.

Following this method of reasoning, it will be observed that, in the case of towns with well-paved streets and yards, and houses built closely together, the storm-water discharge will naturally be expected to be greater than where the streets are constructed of more absorbent material, or where the streets are not made at all. Where the buildings are further apart and the degree of permeability is greater the discharge to be dealt with will be less.

Mr. Wallington Butt, in a paper on the subject of "Calculation of Storm-water Discharge," which he read in 1907, rightly stated that the extent to which a town area has been built upon is in some measure also an indication of the impermeable area; in other words, the density of the population bears some relation to the area of impermeable surface in that district.

Mr. Wallington Butt at the same time submitted a diagram which he considered would assist to ascertain this factor and this diagram is now reproduced for our present purpose. It is well, however, to point out that the limitation of this diagram is a population of 100 persons to an acre. Some towns have a much greater density of population than this—for instance, in Manhattan, New York, it approaches 1,200 persons per acre, but where it exceeds, say, 100, it can be assumed that the area in question is entirely built upon, and the factor will be almost unity.

It is, of course, essential that the drainage area should

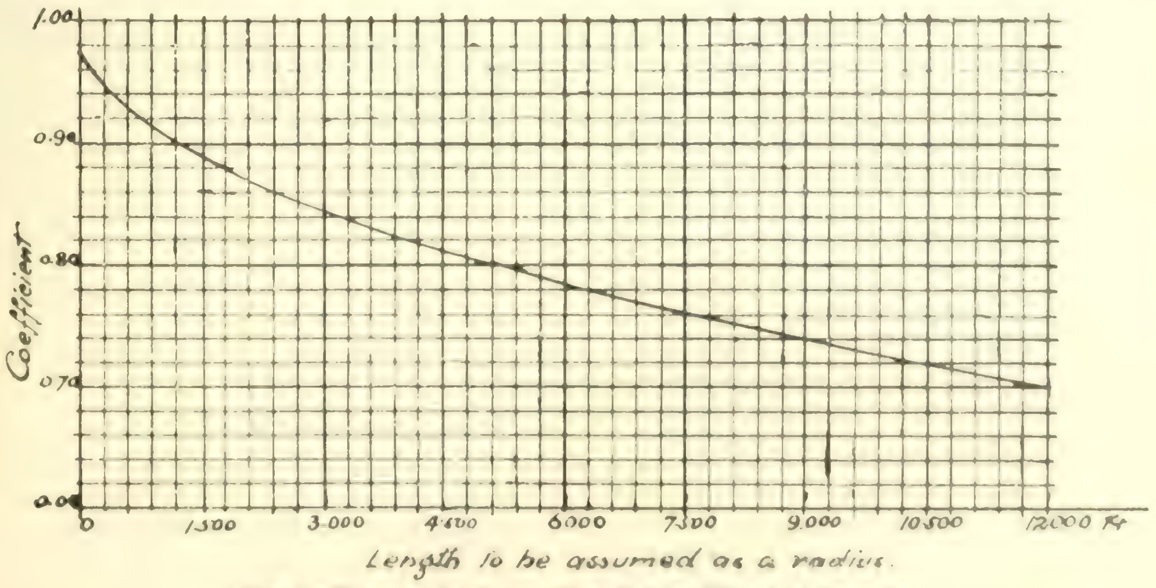


Fig. 3.—Diagram for determining the coefficient of intensity.

be divided into smaller districts, the number of houses in each district counted, and allowing a certain number of inhabitants to each house, the population per acre is ascertained, and the diagram Fig. 4 will give the coefficient of impermeability.

The following comparison of German and British standards will be useful:—

German classification of areas	Equivalent British standard in population per acre.	Coefficient of imperme-ability.
(a) Area densely built upon	75	0·80
(b) Area less densely built upon, with larger yards	65	0·60
(c) Area [illegible] houses with larger gardens and yards	45	0·50
(d) Area openly built upon, detached villas &c.	25-35	0·30-0·40
(e) Rural districts, with gardens, meadows &c.	15	0·20
(f) Parks, forests, &c.	6	0·10

Retardation

In addition to the foregoing factors, which influence the manner in which storm water is discharged from any area, there is still another.

If the time required for the storm water to flow from the upper end of any sewerage system to any other given point is longer than the duration of the storm, then the water from the furthermost limits will reach the latter point when the water from the vicinity of that point has already been drained off, and thus the whole area, in such a case, will not be contributory simultaneously. In other words, the water from the remotest parts of the drainage area, owing to the distance it has to travel to the point in question, has been retarded from being discharged at the same time as the water from the parts near the lower point, hence the term "retardation." Mr. Baldwin Latham, one of the leading British engineers, stated that, although rain fell in Manchester for 151 hours and 10 minutes, it took 1,008 hours for the water to flow off through the sewers, and this he attributed to an "extenuation of the flow."

To arrive at an appreciation of the influence of retardation we may consider the subject in the following manner:—Let L denote the length of a sewer, and V the mean velocity of the flow of water in the sewer, then if we consider a small quantity of storm water entering the upper end of the sewer, the time it will take to reach the given point or outlet will be L/V. If D denotes the duration of a storm, then the total time T from the commencement of the storm to the moment when the storm water will practically cease to flow through the sewer will be—

T equals D + L/V.

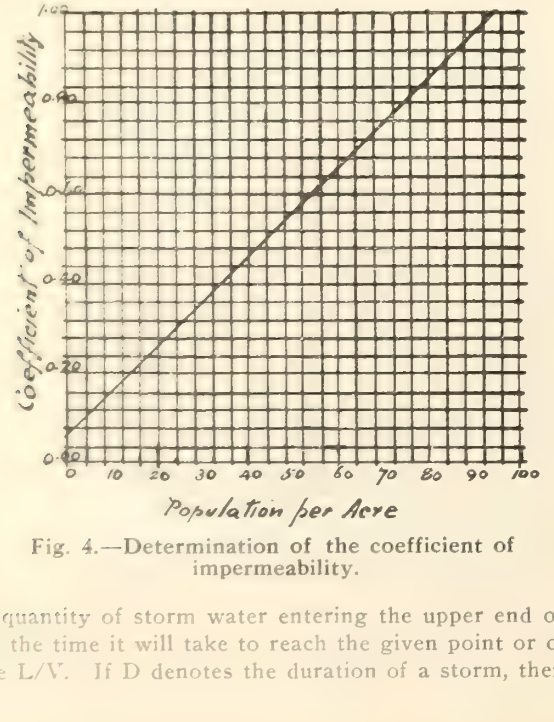


Fig. 4.—Determination of the coefficient of impermeability.

That is, the time for discharge, whether the water flows in an open watercourse or in a close sewer, will be greater than the actual duration of the storm. But this fact does not warrant the sectional dimensions of the sewer being diminished, for such a reduction is possible only when the duration of the storm is less than the time required for the water to be discharged through the sewer, that is, when D is smaller than L/V or when L is greater than V × D.

With storms of great intensity and of small duration, retardation will take place even in short lengths of sewers, but when the storm continues for hours retardation will have no influence, even if the sewers are of considerable length. It will depend upon the duration of the maximum precipitation assumed and on the velocity of flow in any particular sewer whether or not retardation will take place.

If the drainage area is within that part of a city which is built upon, then V will be determined solely by the inclination given to the sewer. The time required for the water from the roofs, yards, and paved streets to drain into the sewers will be so short in comparison to the period which the storm water will take to reach the outlet that it can be ignored. In the case of rural districts, or openly built upon areas of a city, it will be necessary to allow a minute or so for the water to reach the sewers.

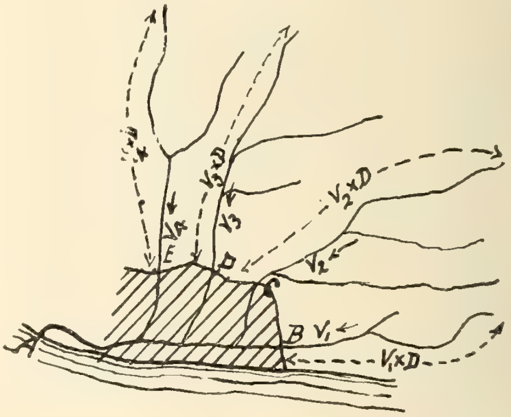


Fig. 5

If an area such as is represented by Fig. 5 is considered, the value of V × D for the upper lengths of each sewer can be computed, and then the points B, C, D, E will indicate the limits of the area in which retardation will occur, and must be taken into account.

In most cases the duration of a storm which will give rise to the maximum rate of flow will be not less than 20 minutes, or 1,200 seconds.

V is usually greater than 2.3 ft. per second, therefore in sewers shorter than 2,500 ft. to 3,000 ft. in length retardation may be considered as exceptional.

The question will now doubtless be asked, What will be the effect or influence of retardation on the discharge of storm water?

Such influence may be made clear in a simple manner if we consider a rectangular area E. F. G. H in the accompanying figures.

The line AB represents the main sewer which drains the area bounded by the rectangle E, F, G, H. At the commencement of a storm of duration D, the water from the vicinity of B will be the first to reach the outlet, and this is represented by the triangle H C B, which is shaded in Figs. 6 and 7. During the storm the adjoining area will be drained as indicated in Fig. 8. When the storm ceases, then the water from the vicinity of B will cease to flow, and this is indicated by the unshaded triangle H N G in Figs. 9 and 10; the length of the shaded part is equal to V × D. When the point C of the shaded part has reached the upper limit of the drainage district, then the extent of the figure representing the discharge will gradually diminish until the last portion of the storm water is drained away, as shown in Fig. 11.

Let q denote the quantity of storm water discharged per unity of drainage area.
A denote the extent of the drainage area.
a denote the contributory area,

then the ratio $\frac{q \times a}{q \times A} = \frac{a}{A} = R$, the factor by which $q \times A$ has to be multiplied so as to obtain the actual quantity of storm water discharged. This factor is called the factor of retardation.

Example.—Let L equal 12,000 ft., V equal 2.3 ft. per second, D equal 1,200 seconds.

$$\text{Then } R = \frac{a}{A} = \frac{V \times D}{L} = \frac{1{,}200 \times 2.3}{12{,}000} = 0.23 \text{ of the area.}$$

By the foregoing discussion and diagrams it is manifest that, in addition to rainfall intensity, the configuration, extent and shape of the drainage area, as well as the velocity of flow in the sewers, are the essential factors which may cause retardation.

Fig. 6

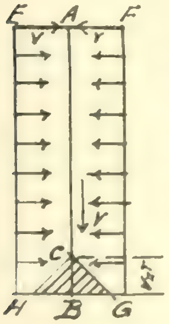


Fig. 7

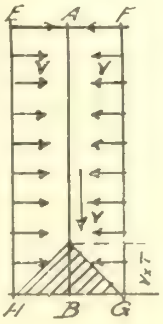


Fig. 8

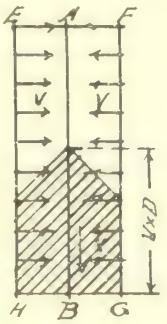


Fig. 9

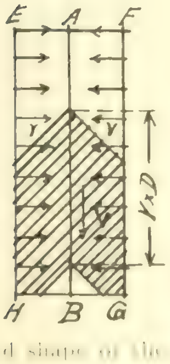


Fig. 10

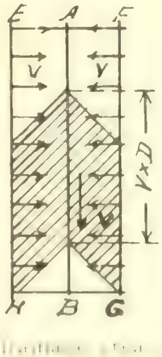
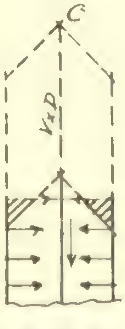


Fig. 11



Drainage Area Configuration

It is manifest that the permeability of a surface must be a question of degree, for even dense clay will absorb water if it is given time. If the drainage area is very flat and even, rain water will naturally remain on the surface for a longer period, and will be gradually absorbed, evaporated or drained away. The time taken to flow off the surface depends on the slope and general conformation. In a district which consists of hills and dales the water will run off quickly. Configuration also constitutes an important element in the laying out of storm-water sewers.

Extent

The extent of a drainage area, so far as retardation is concerned, is a matter of importance, so far as it is a function of its length; for it will be agreed that the time required for the water to concentrate at any given point will depend on the distance it has to travel, and, according to statements already made, the intensity of a storm will vary inversely in proportion to the length of the sewer.

Shape

The shape of a drainage area is another factor which has to be considered, for if the area is long and narrow it will be observed that the period of concentration will be greater than if the area is compact.

Velocity of Flow in Sewers

The factor of retardation is controlled by the velocity of flow in the sewers, inasmuch as the latter directly determines the time of concentration—that is, T equals L/V. If the sewers are laid with steep grades, a larger drainage area will be contributory, in a given time, than if the grades were made flatter. High velocities tend to eliminate retardation, while low velocities cause retardation to take place sooner.

Generally

It is a matter of considerable importance that protection should be afforded the public against flooding, for, apart from the disagreeableness of such an occurrence, it is also a menace to the health of a community. There is, however, a limit to which the engineer is justified in expending large sums of money in the construction of sewers of such dimensions as to be absolutely safe against flooding or gorging.

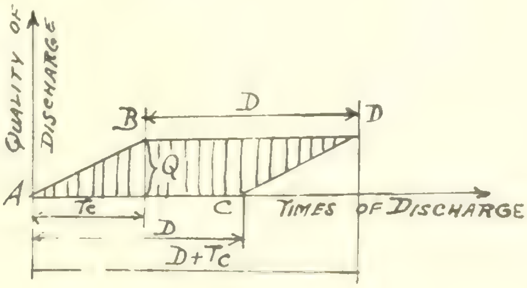


Fig. 12

If the greatest rainfall intensity ever observed in any district is assumed as the basis for calculating the dimensions of sewers, it may be found that the sewers will be of such inordinate sizes that they will rarely be used to their full capacity, and be so costly as to be financially impossible.

To adopt lower rainfall intensities will mean the facilitating of the execution of such works; but this may also incur some liability caused by occasional floods. The question, therefore, for the engineer to consider carefully is the disadvantages that may arise by the adoption of lower rainfall intensities as compared with the increased cost of larger sewers.

In Germany about 70 litres per second per hectare represents the lower limit, but this, according to observations made in Berlin, for instance, is exceeded about five times each year. To exceed 150 litres per second per hectare is recommended only in exceptional cases.

In districts such as Basel, where the annual rainfall (840 mm.) is considerably greater than in Berlin (597 mm.), a greater rainfall intensity is assumed; for instance, Burkli-Ziegler considered 125 litres to 200 litres per second per hectare as suitable for Switzerland.

Both Hawksley's and Burkli-Ziegler's formulae were intended to include all circumstances which tended to diminish the discharge. Subsequent to their investigations, it was realized that the influence of the different conditions of impermeability of the surface deserved more attention, and consequently [illegible] a separate coefficient to cover that point. Following this [illegible] [illegible] of the problem, however, German engineers [illegible] [illegible] fully developed the important feature of the factor of retardation. Many capable American engineers have endeavored to construct a formula which will be generally applicable for computing the discharge of storm water, but they have met with very little success, because they tried to combine the heterogeneous factors affecting such discharge.

Mr. Lloyd Davies and Mr. Wallington Butt stated that the maximum discharge is attained when the duration of the storm equals the time of concentration. As the intensity of a storm varies inversely with its duration, in the case of sewers having great lengths the intensity will consequently be considerably reduced.

In many instances, however, it is not a storm of long duration and low intensity, but a storm of short duration and a great intensity which will cause the maximum rate of flow in sewers, even if only a fractional portion of the area is contributory. For example, in a district having an irregular shape, where the area near the outlet constitutes the major part, then during severe storms the water from that portion will concentrate quickly at the lowest point, while that from straggling and remote parts will require more time to reach the same place. If, in such a case, the intensity is derived from the time of concentration, then it will be too low.

It also often occurs that rainfalls of high intensity and short duration cannot be ignored, as they may happen when the sewers are already filled by the run-off of the preceding rainfall.

In an important case it is highly desirable to ascertain which kind of rain will give rise to the maximum rate of flow. A rainfall of high intensity will generally be assumed, and the discharge ensuing is to be considered in its different stages. This can be effectively done only by constructing flow areas as has been suggested by the late Prof. Fruhling, of Dresden. Such flow areas can be drawn on squared paper: the horizontal lines—abscisse—will represent the time in minutes, and the vertical lines—ordinates—will represent the volume of storm water in cubic feet.

Before proceeding to explain the method of constructing flow areas and curves, it will be necessary to submit the following formulae:—

Let Q = volume of storm water discharged in cu. ft. per sec., when the whole of the drainage area is contributory.

Q_t = volume of storm water discharging at any time during or after a storm, in cu. ft. per sec.

P = coefficient of impermeability, taken from diagram or table.

R = quantity of rain reduced to cu. ft. per sec. per acre.

I = coefficient of rainfall intensity; see table or diagram.

A = drainage area in acres.

T_c = time required for storm water to concentrate at the lower end on the sewer of L length, in minutes

L = length of sewer in feet.

V = mean velocity of flow in sewer in ft. per sec.

D = duration of storm in minutes.

T = any time in minutes.

Then (1) $T_c = L/V$

and (2) $Q = P \times I \times R \times A$.

In the preliminary design of a sewerage system the length of any particular section is known, and the velocity of flow may be assumed at, say, 3 ft. per second, when running half full or full, so that the time T_c required for the storm water under such condition to flow from point to point can be easily ascertained by formula (1).

The duration of a storm is D, and the ordinates representing the volume of storm water Qt for any time, T will be as follows:—

If T is greater than zero and less than T_c then

$$Q_t = \frac{T}{T} \times Q;$$

if T is greater than T_c and less than D then $Q_t = Q$;
if T is greater than D and less than $D \times T_c$ then

$$Q_t = \frac{(T - D) - T}{T_c} \times Q;$$

if $(D \times T_c)$ is less than T then $Q = O$ (see Fig. 12).

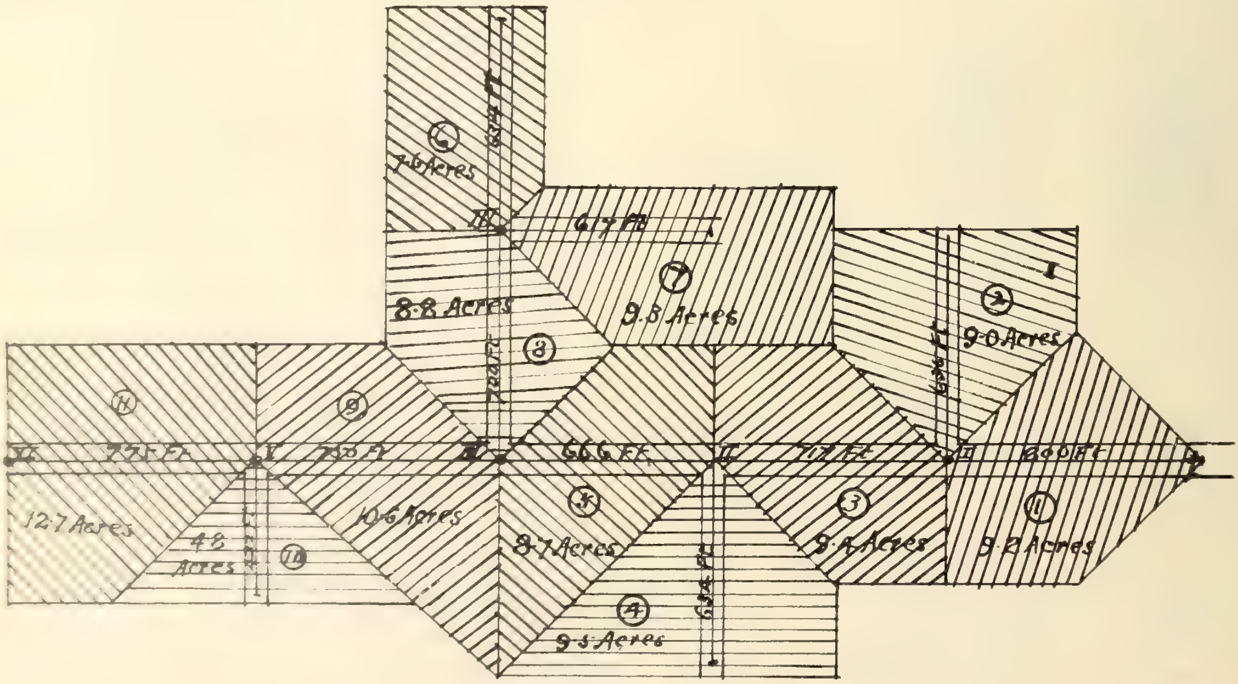


Fig. 13.—Plan showing storm-water sewers of a district.

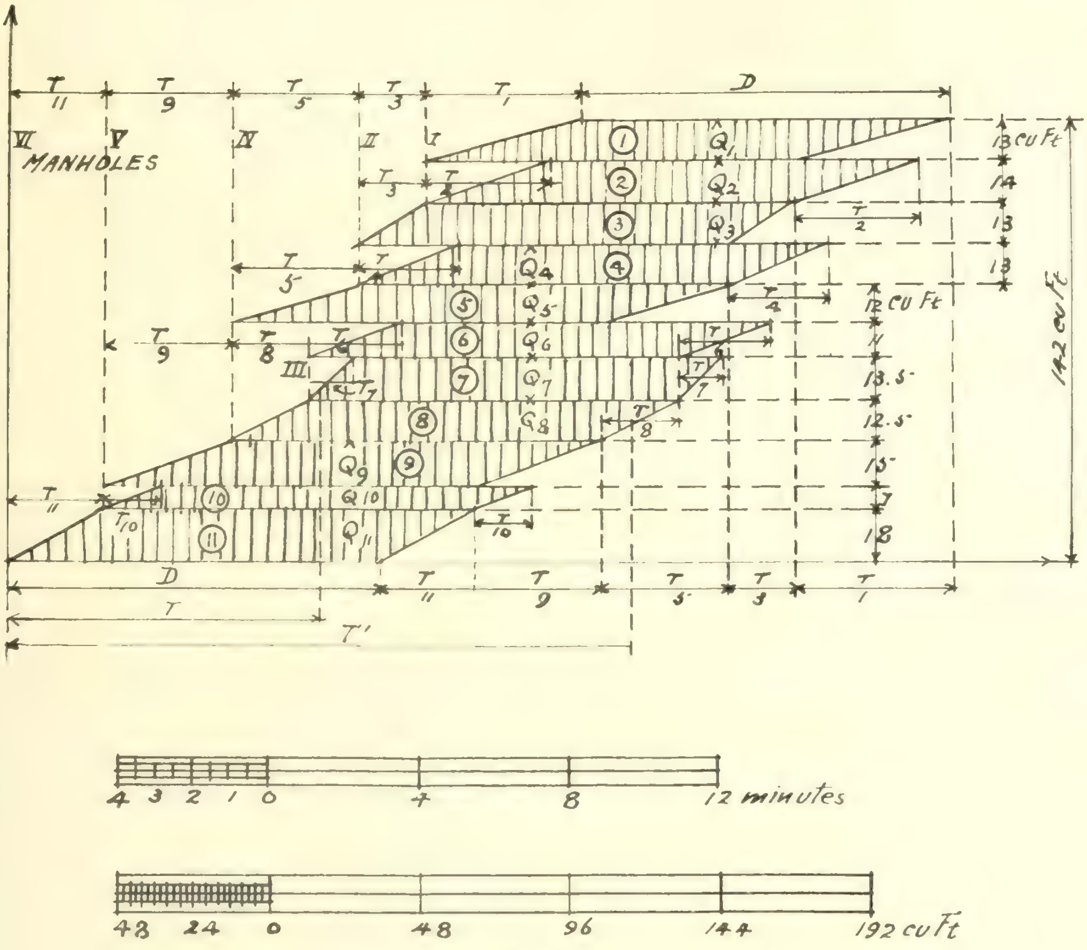

T 11
T 9
T 5
T 3
T 1
D
VI
V
IV
II
I
III
MANHOLES
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
13 cu Ft
14
13
13
12 cu Ft
11
13.5
12.5
15
7
18
142 cu Ft
T'
4 3 2 1 0 4 8 12 minutes
48 24 0 48 96 144 192 cu Ft

Fig. 14

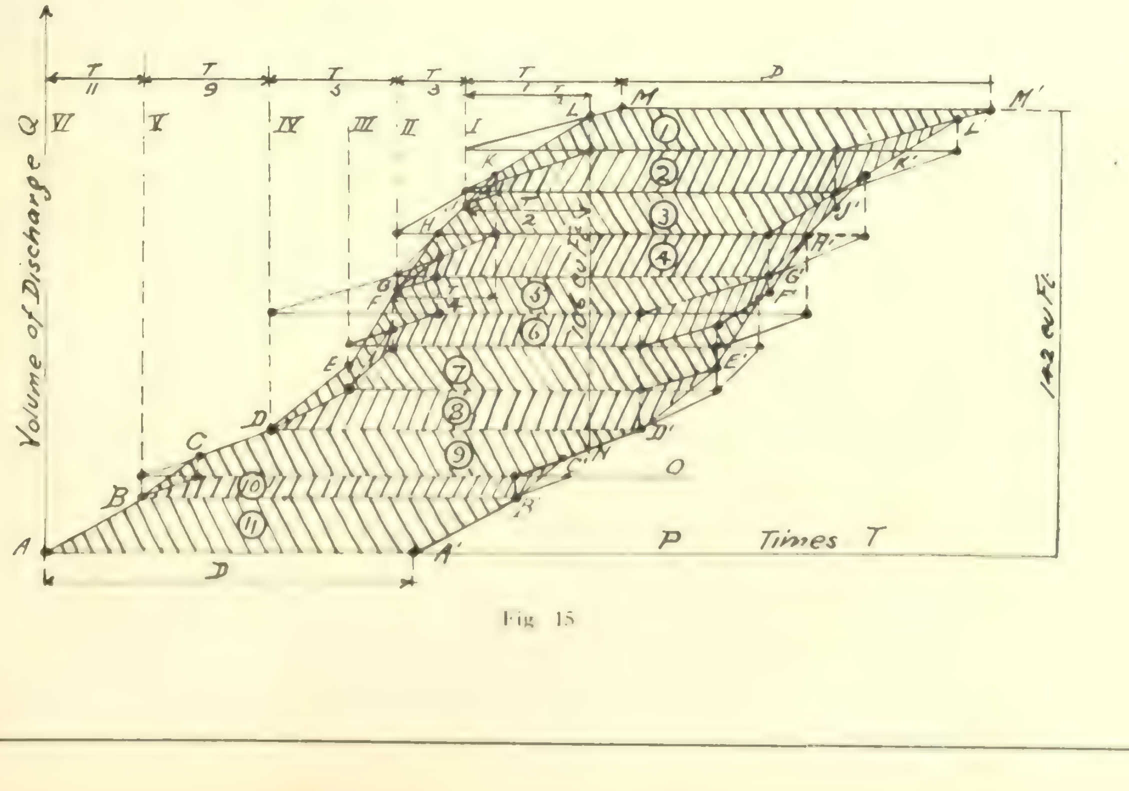

T 11
T 9
T 5
T 3
T 1
D
VI
V
IV
III
II
I
Volume of Discharge Q
A B C D E F G H J K L M
A' B' D' E' F' G' H' J' K' L' M'
N
O
P
Times T
106 cu Ft
142 cu Ft

Fig. 15

The volume of storm water run off is represented by the flow area having the shape of the rhomboid A B C D, and the period of concentration, as well as the quantity discharged at any time at the lower end of any sewer having, L length, and during any storm of D duration, is clearly indicated in the diagram Fig. 12. It may be explained that in this case the direction of the flow is from the right to the left, and the outlet is situated at the toe-point A.

Recapitulation

It is to be hoped that what has already been stated regarding the problem of calculating the quantity of storm water to be dealt with in any district has been expressed in explicit terms, and that it will be recognized that, having regard to the variable factors which have to be considered, the best way of arriving at a satisfactory solution will be by drawing flow areas.

The engineer will therefore have first to—

(1) Assume the intensity of the rainfall.

(2) Ascertain if retardation takes place.

(3) If retardation does not take place, then use formula . . . .

(4) If retardation does take place, then draw flow-areas.

Example

A complete example will now be worked out to illustrate the method which the writers submit is the more rational one to follow.

The plan shown in Fig. 13 is presented as a typical layout of a sewerage system for storm water. There are six sections, to which eleven areas are to be drained.

Assumptions

Duration of storm = 10 mins. or 600 secs.

Rainfall = 2 cu. ft. per sec. per acre.

Scales of the flow areas are—

Time 1 in. = 4 minutes.

Volume of discharge 1/48 in. = 1 cu. ft.

Commencing with section 1—

L = 800 feet.

V = 3.2 feet per second.

Time of concentration $= \frac{L}{V} = \frac{800}{3.2} =$ 250 secs. or 4 mins. 10 secs.

Coefficient of impermeability for, say, 70 persons per acre, as per diagram = 0.77.

Coefficient of intensity for a section 800 ft. long, as per table, equals

$$1 - 0.0028 \sqrt{800} = 0.92.$$

The drainage area for section 1 is 9.2 acres.

Accordingly the volume of discharge will be—

Q. Area × rainfall × coefficient of impermeability × coefficient of intensity.

Q. $A \times R \times P \times 1 = 9.2 \times 2 \times 0.77 \times 0.92$.

Q. 13 cu. ft. per sec.

Having ascertained the time of concentration and the volume of discharge as above, the flow area is plotted in the top right-hand portion of the diagram Fig. 14.

The volumes of discharge for the other ten areas can be arrived at by analogous calculations, and the following results will be obtained:—

Section 1. 13 cu. ft. per acre
2. 14 " "
3. 13 " "
4. 13 " "
5. 12 " "
6. 11 " "
7. 13.5 " "
8. 12.5 " "
9. 15 " "
10. 7 " "
11. 18 " "

Total 142 " "

So that the total discharge at manhole VI. amounts to 142 cu. ft. per second.

Fig. 14 shows the flow area for each section and drainage area illustrated in Fig. 13.

Those who wish to draw similar charts may be guided by the following simple rules:—

(1) Start by drawing the flow area of the section of sewer lying near the remote limits of a district—that is, the farthest from the point of outlet—and then proceed, section by section, downwards in the direction of the flow.

(2) Flow areas of sewers which meet at a manhole have the same abscissae—i.e., the toe-points of their ascending slopes are located perpendicularly above each other.

(3) The flow area of a sewer section located between two manholes is to be drawn beneath those of the upper sections, the toe-point being moved leftwards, a distance corresponding to the time of concentration for that particular sewer.

(4) Secondary collecting sewers joining the main sewers will have to be dealt with in a similar manner.

The chart illustrated in Fig. 14 has been constructed in accordance with the foregoing rules.

The volume of discharge passing through manhole VI. at the time T is represented by an ordinate erected at T and cutting the flow areas 11-5. The parts of the erected ordinate which signify discharge are those which lie within the shaded areas. The flow areas 4-1 are not passed through by the ordinate, which shows that they are not yet contributing. Whereas at the time T^1 the sections represented by the flow areas 9-1 are discharging into manhole VI., while the water from sections represented by flow areas 11-9 has already run off.

Fig. 15 has been prepared by depressing the projecting points on the left and elevating those on the right to the area next to them, and so a flow curve is obtained, which is characteristic for the volume of storm-water discharge at any time from the whole drainage area under discussion.

It will suffice to construct only the ascending curves A, B, C, etc., because the descending curves M^1, L^1, K^1, etc., are parallel to them.

The largest ordinate of the total flow area will give the maximum rate of flow on which the calculations of the sewer dimensions are to be based.

In the present example the ordinate L-N shows this maximum rate of flow to amount to 106 cu. ft. per second, and this is the volume of storm water that must be provided for in sections 9, 10 and 11.

The difference between MP and LN indicates how much the storm-water discharge is modified by retardation. In this case the difference equals 142-106, or 36 cu. ft. per second. In a like manner the difference between MO and LN represents the modification of the aggregate flow due to retardation in sections 1 to 9 inclusive.

In conclusion, the writers have to urge upon city engineers and others the desirability of installing automatic recording rain gauges, so as to obtain reliable information concerning the quantity of rain falling in short periods and in different districts, for without this data it is possible that the assumptions which will be made when designing storm-water sewers may be erroneous, and lead to inadequate or excessive provision for storm water. In each city the rainfall should be automatically recorded for those having a duration of 2 to 120 minutes, and such data plotted as shown in Fig. 1, illustrating the intensity of the rainfall. The rain gauges required for this purpose are to be had at a moderate price, while the information thus secured will be of great value.

Operations in Full Swing at the Coast

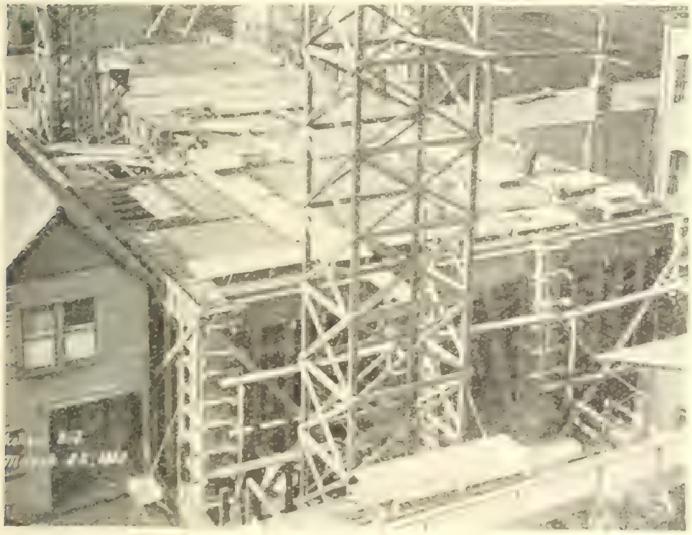
Activity in All Trades—Progress Reports on the More Important Undertakings—Interesting Constructional Features

Office of The Contract Record,
Vancouver, May 8, 1913.

THE universal activity in the constructional field at the coast was strikingly evidenced during April by the extensive developments under way at Vancouver and district, and in the cities of Victoria and New Westminster. In building circles the returns for the month were considered highly satisfactory, although in the actual number of value of permits issued during this period there is a considerable decrease, compared with the corresponding month in 1912, the figures reading:

Permits for April, 1912	352
Value of building for April, 1912	$1,632,705
Permits for April, 1913	219
Value of buildings for April, 1913	$1,103,352

The decrease of over $500,000 in April, however, is offset by the figures in the building statement for the first four months of the present year, an advance of nearly $250,000 in value of permits being noted over the same period of last year.


Yorkshire Guarantee Building, Seymour Street, Vancouver

The Point Grey district continues to flourish in a building sense, permits being issued at the rate of five or six a day. The residences planned are all of a substantial type, the cost of each structure averaging between $2,500 and $3,000 An increase in dwellings in the Kerrisdale section is particularly noticeable. South Vancouver, West Vancouver and Burnaby municipalities are also reported extremely active at present, the indications pointing to an even greater movement in the building of homes than was the case last year

In New Westminster many new business blocks have been planned for early construction, and in the erection of apartment houses, schools and dwellings the Royal City is keeping well to the fore, new records being established almost every month

The improved conditions in the building trade at Victoria are indicated by a substantial increase in the number and value of permits issued in April compared with that month a year ago. The outlook for the summer months is very gratifying, an unprecedented amount of construction being projected for the city and district.

Rapid Building Progress at Vancouver

Excavating work has been proceeding since April 1 on the site of the proposed fifteen-storey Weart Block at the corner of Richards and Hastings streets, Vancouver, and it is expected that by June 1 the preparations for the construction of the basement will be about completed. This building will be of steel construction faced with pressed brick and terra cotta, and will be used as an office block. When completed it will represent a total expenditure of approximately $700,000. The Canadian Ferro-Concrete Company has the general contract, Messrs. Russell Babcock & Rice are the architects; Mr. E. G. Cullen, Vancouver, has been awarded a contract for the terra cotta, the material being the product of the Atlantic Terra Cotta Company. The order is one of the largest that has been let in Vancouver.

Yorkshire Guarantee Block

Within the past few weeks exceptionally rapid progress has been made on the construction of the new ten-storey Yorkshire Guarantee Block situated on Seymour street, between Pender and Dunsmuir streets, Vancouver. The reinforced concrete frame, which has now reached the fifth storey, has been raised to its present height in the remarkably short time of three weeks, and it is the intention of the contracting firm to extend the building to its full height with all possible speed. This building measures 50 x 120 feet, and will be treated on the front elevation with selected pressed brick and terra cotta. From the standpoint of the interior, the building will be a distinct credit to the city. The floors of the banking rooms on the ground floor will be laid in tile, with marble baseboards. Hardwood will be used for the counters and office partitions, and all interior fittings will be bronze. The entrance lobby will be of marble tile, and this material will also be employed on the stairways and as wainscotting in the corridors. The offices in the upper floors will be elaborately finished in high grade materials, the interior arangements throughout being planned on the most elaborate lines. The Dominion Construction & Supply Company is handling the general contract. Somervil & Putnam are the architects.

New Y. M. C. A. Building

After a delay of several months, due to the non-arrival of materials from eastern points, active construction has at last commenced on the new Vancouver Y. M. C. A. building, located on Georgia street, between Burrard and Thurlow streets.

Six huge steel girders, weighing 27 tons each, said to be the largest ever fabricated for a Vancouver building, will be used in supporting the four storeys of the building over the gymnasium. The use of these girders will eliminate supporting columns in the gymnasium, thus allowing a perfectly clear floor space. The general construction is reinforced concrete and steel, the first two storeys being of steel. Terra cotta will be used in the first storey, while the succeeding five storeys will be faced with red paving brick, and the top storey will be terra cotta with galvanized iron cornice. The entrances and vestibules will also be decorated in terra cotta. The interior has been planned along the lines of the most up-to-date buildings of this class, and the equipment throughout will be thoroughly first-class. Mr. H. S. Griffiths, of

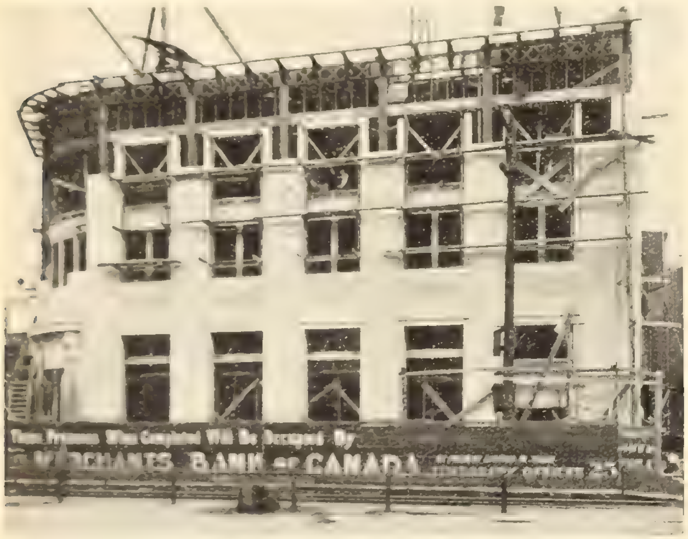
Vancouver and Victoria prepared the plans, and Messrs. [illegible] Campbell & Whipple, Limited, of Vancouver, have charge of the general contract.

The Canada Hotel

Work on the exterior of the new Canada Hotel, situated on Richards street, Vancouver, was practically completed at the end of April, and a considerable portion of the interior finish was well advanced by that date also. Mr. E. J. Ryan is handling the general contract of this building, which measures 50 x 120 feet, and is of steel and mill construction, faced with buff pressed brick and stone. The cost of the structure will be about $150,000, Mr. Emil Guenther prepared the plans.

Progress on the Merchants Bank

The Norton Griffiths Steel Construction Company report excellent progress on the new three-storey steel and concrete building which is being erected at the corner of Hastings and Carral streets, Vancouver, for the Merchants Bank of Canada. Work on the interior has been very rapid and nearly all the stone and terra cotta work is finished to the full height of three storeys. A large force of men has charge of the interior and it is hoped to complete the entire structure early in the summer. The foundations have been constructed strong enough to carry seven additional storeys if required. An approximate cost of $100,000 has been estimated for this structure. Somervil & Putnam are the architects.



Merchants Bank of Canada, corner of Hastings and Carral Streets, Vancouver.

Additional Structures Planned

The Wineland Contracting Company is making preparations to start the construction of a four-storey reinforced concrete building in the 200 Block, Pender street east, Vancouver. The ground floor will be occupied by stores, and the upper storeys will contain rooms. Pressed brick will be used as exterior facing, and the cost of the entire structure is placed at approximately $75,000.

Mr. G. P. Bowie is the architect for a four-storey apartment house to be located in the 1100 Block, Seymour street, on which work will commence in May. The building will be of mill construction and will represent an outlay of approximately $70,000.

The Vancouver civic building department recently issued a permit to Mr. J. J. Hanna for the erection of a two-storey reinforced concrete and brick office building in the 1000 Block, Georgia street. The cost will be about $30,000.

Plans have now been completed by the Westinghouse-Church-Kerr Company, Vancouver, for a new store building which the C. P. R. intend erecting in the False Creek yards for the service of the sleeping and dining car department. The buildings will embrace bake shops, commissariat, kitchen, and a complete refrigerating installation, and will cost $70,000.

Messrs. Gardiner & Mercer, architects, New Westminster, have received instructions from the provincial government to prepare plans and specifications and call for tenders for a three-storey addition to the land registry office on Lorne street, in New Westminster. The structure will be of reinforced concrete, and brick construction. The estimated cost is approximately $35,000.

Messrs. Campbell & Wilkie, Vancouver, have been awarded a contract for the erection of the Industrial School for Girls, at the corner of Cassiar and Union streets, for the provincial government. This building will measure 126 x 174 feet, and will be two-storeys in height. It will be of reinforced concrete construction, faced with brick and stucco, and is estimated to cost $100,000. Mr. A. A. Cox, Vancouver, was the architect.

A permit was recently granted the B.C. Electric Railway Company to erect a one-storey frame building with concrete foundation in Kitsilano, Vancouver, at a cost of $23,000 to be used as car barns.

Work will commence immediately on a three-storey steel, brick and mill construction store and rooming house building to be erected on Pender street, between Abbot and Carral streets, for Messrs. Storey & Campbell, Vancouver. The measurements are 36 x 120 feet, and the cost is placed at approximately $35,000.

Plans for a new warehouse building to be erected on Homer street, Vancouver, were recently completed by Mr. R. Watson, architect. This building will be of brick and mill construction, two storeys in height, and will cost about $30,000. It will be equipped with two freight elevators, tar and gravel roofing, galvanized cornice, etc. Messrs. Adamson & Main, Granville street, are the owners.

Plans of the Old Peoples' Home building, to be erected in Hastings Townsite, will soon be completed by the architects, Messrs. Perry & Fowler, Pacific Building, Vancouver. This structure, measuring 97 x 147 feet, will be of brick and mill construction, two storeys in height, with concrete basement and a hot water heating system. The cost will be approximately $50,000.

New Buildings for Victoria

Excavating for the foundations of the new provincial jail at Victoria is now completed and the B. C. Construction Company, the contracting firm, will push work on the superstructure with all possible speed, as it is intended to complete this large contract during the current year.

Plans for the proposed $100,000 drill building to be located on Bay street, Victoria, will soon be completed by the architect, Mr. W. Ridgeway Wilson. Tenders will be invited during May.

Construction will commence immediately on a three-storey apartment block on the corner of Cook and Leonard streets, Victoria, for which Mr. G. C. Mesher is the architect. The construction is to be reinforced concrete and cement stucco. The cost is expected to reach $50,000.

Plans have been completed for a new Kinemacolor Theatre to be erected by the Island Amusement Company on the corner of Cormorant and Government streets, Victoria, at a cost of approximately $35,000.

Architects' Exhibition

The Vancouver Chapter of the British Columbia Society of Architects has arranged to hold an exhibition commencing on the evening of June 18 and continuing for a period of two weeks. The exhibition will consist of a selection of the best architects' work executed and contemplated in this province, including plans, rendered drawings, photographs, foreign sketches, also cartoons for art glass and for mural work. In addition to the work of the local chapter, it is intended to hold a complete exhibition of the photographs of the buildings of the World's Fair now in course of construction at San Francisco. The general committee in charge comprises Messrs. J. R. Putnam, W. T. Whiteway, T. Hooper, A. A. Cox, and W. S. Painter.

Changes in Vancouver Building By-laws

Important changes in the building by-laws of Vancouver were recently drafted by Mr. S. N. Jarrett, city building inspector, and approved by the building committee of the city council.

One of the new amendments provides that when an apartment, tenement or lodging house is over two storeys in height an open passage-way, not less than three feet in width and seven feet in height, must be left at the lowest level of its inside court, connecting with a street of alley, thus giving a free circulation of air, which is impossible under the present by-law.

Another important provision is that no apartment, tenement or lodging house shall be erected upon any lot unless the front of the lot abut on a street not less than 40 feet wide, and that no such building shall be built on the rear of any lot unless the rear of the lot abut upon a street or lane not less than 20 feet wide. When a street or lane is less than 20 feet wide, a building must be so located as to provide for 20 feet of clear space between the building and the farther side of the street or lane.

In future it will also be impossible to erect two apartment or tenement houses on one lot between street lines unless the buildings are separated by an unoccupied space extending across the entire width of the lot. This space is regulated by the height of the buildings, and the minimum space must be ten feet wide; and if the lower of the two buildings is three-storeys high, the space then must be fifteen feet in width, increasing three feet in width for each additional storey.

In the rear of each apartment, tenement or lodging house erected on an inside lot, there shall be a clear space extending across the entire width of the lot of not less than 12 feet wide, except when such lot abut upon a street, lane, or public square of not less than 20 feet wide.

In connection with inside ventilating shafts, among other things the new regulations will provide for a horizontal intake or air-duct at the bottom of shafts communicating with a street, yard or court, such air-duct to be not less than four square feet in area and to be so arranged as to be easily cleaned.

Canadian Mineral Rubber Company's Contracts

During April, the Canadian Mineral Rubber Company, Vancouver, started the actual paving work on the four and a-quarter miles of Kingsway between the New Westminster city limits and South Vancouver. The company will endeavor to have the road completed in time for the Pacific Highway convention which is to be held in August. Rapid progress has been made on the Central Park end of the road, the construction of wooden culverts and the required grading operations being almost finished. On the completion of the latter branch of this work, the stone curbs and the six-inch concrete base for the pavement will be laid preparatory for the mineral rubber composition which is laid on the surface of the road. All surface drainage pipes which will lie beneath the pavement will be constructed of steel pipes embedded in cement, while those falling without the pavements are being constructed of wood. Where a natural water-course crosses the roads, abutments are erected on either side of the mouth of the drain. At the present time the company, besides their work near Central Park, is proceeding with the three to four foot cut between Wise Road and Edmonds. From this cut alone it is expected that approximately 20,000 yards of gravel will be removed. The gravel thus obtained is being used to reduce the grade between the New Westminster city limits and Wise Road. From the whole length of Kingsways it is anticipated that 50,000 cubic yards of material will be removed form the hilly portions of the road and dumped in depressions. About 10,000 feet of macadam, it is estimated, will be removed from the length of the road and deposited on the side streets adjoining, in order that all the streets immediately leading to Kingsway may be in thorough repair. The company estimate that 18,000 cubic yards of rock will be required for the concrete work, the total amount of concrete material to be laid being estimated at 30,000 cubic yards. The Canadian Mineral Rubber Company was recently awarded contracts for street paving in Nanaimo, amounting to approximately $250,000. The paving work in this contract includes many of the principal streets of the Coal City, representing about 100,000 yards, and provides for an asphaltic concrete surface on a five-inch concrete base. An early start will be made on the work.

General News

It is understood that the C. P. R. has filed plans at Ottawa for the long-proposed tunnel under Vancouver. It will connect Burrard Inlet with False Creek, and will be almost a mile long. Reliable information regarding methods of construction and the probable date of the commencement of the work is lacking at the present time.

Railway construction in and around Kamloops promises to be exceptionally heavy this summer, and before the end of the year it is estimated that several million dollars will be expended in the district on railroads alone. The Canadian Northern Pacific is rapidly laying steel on its main line from this divisional point, north, east and west. The erection of stations and roundhouses, as well as the construction of the company's branch line to the Okanagan district, will form an important part of the programme for this summer. The C. P. R. is taking tenders for grading, etc., on double track at Kamloops, and active operations will commence about the third week in May.

Excavation for the following of the Georgia-Harris street viaduct at Vancouver has been completed by the contractors, the J. McDiarmid Company, and the concrete work on the foundations is now well under way. It is hoped to start work on the concrete forms for the bridge proper early in May. All the necessary material has been ordered, and the work of construction will proceed steadily from now onwards. The bridge is to be constructed of reinforced concrete except for the part over the C. P. R. yards where steel will be encased in concrete.

Half of the proposed by-laws for 1913, aggregating $1,305,000, were defeated by a vote of about 8 per cent. of the electorate in South Vancouver during April. The roads by-law for $575,000; sidewalks by-law for $30,000; and waterworks by-law for $130,000 were each passed by substantial majorities, while the school by-law for $450,000, hospital by-law for $35,000 and fire halls by-law for $85,000 were defeated. This is said to be the first occasion on which a school by-law has been rejected in this province. The total vote was about 834; the names on the voters list number 10,000.

Mr. E. V. Johnson, of Ottawa, inspecting engineer of the department of railways, recently visited British Columbia for the purpose of examining the B. C. section of the Canadian Northern Railway. Accompanied by Mr. T. H. White, chief engineer of the B. C. section of the C. N. R., he inspected the grade between Hope and Kamloops, also the graded portion north of Kamloops, afterwards leaving for Edmonton to look over the same line as far as Tete Jaune Cache [illegible] Summitt.

Mr. A. D. Creer, assistant engineer to Mr. R. S. Lea on the Burrard Peninsula Joint Sewerage Scheme, recently visited Prince Rupert at the request of the civic authorities to give advice and information with respect to the trunk sewerage system which it is proposed to install in the Grand Trunk Pacific terminal city. After making a personal inspection of the situation it was suggested by Mr. Creer that the rainfall intensity curve, plotted for the general Pacific coast should be followed, in that there appeared to be no definite information procurable as to the intensity of rainfall in the north. The installation of several large trunk sewers together with three outfalls, has been proposed for the city. Two of these outfalls will take the sewerage from the business sections of the city, and it is planned to have them of such dimensions as will provide for the sewerage from the central sections even when the business area is completely built upon. While the plans which have already been prepared will probably be modified in one or two slight respects, Mr. Creer intimates that the cost figures will suffer practically no change.

Commencing April 1, the engineering districts of the public work department of British Columbia have been recognized and the district formerly in charge of Mr. J. P. Forde, who has been appointed resident federal engineer, has been divided into two parts. That portion of it comprising the East and West Kootenay districts and the Boundary country is now under the supervision of Mr. W. B. Wescott, who will make his headquarters at Nelson. Mr. E. P. Girdwood has been appointed assistant engineer with headquarters at Vernon to supervise the balance of the territory formerly covered by Mr. Forde.

Mr. W. W. Bell, of Victoria, who was formerly connected with Grand Tunk Pacific Construction work as chief assistant to Major Hodgins, has been appointed engineer for the construction of the Banff-Windermere Road, by the provincial government. Mr. Bell is known in British Columbia as an engineer of wide and varied experience, and his present appointment is regarded as a guarantee of the very best results.

Before the end of the present year the wooden bridges on the Esquimalt and Nanaimo Railway, Vancouver Island, between Victoria and Wellington, will be replaced with steel structures. The work in view for 1913 on this section of the line includes the erection of twelve steel bridges of the modern type.

Mr. J. R. Freeman, of Providence, R.I., consulting engineer of the Dominion Government on the storage dam across the Coquitlam River, built by the Vancouver Power Company, inspected this immense project during April. He has made periodical inspections of the dam during the progress of construction for several years past.

Mr. A. A. Cox, the well-known Vancouver architect who formed one of the committee of award in connection with the successful design for the new university of British Columbia, has been commissioned by the provincial government to prepare plans for the new provincial buildings at Prince Rupert. It is announced that plans will be prepared and tenders invited without delay, the intention of the government being to erect the buildings this summer. Haddington Island stone will probably be used in the construction, and the cost is estimated at between $300,000 and $400,000.

The Canadian Northern Railway have submitted a plan to the Canadian Pacific Railway and Grand Trunk Railway for the erection of a Union station, to be built on the west side of the Don River and just north of Queen street, Toronto. This would cost approximately a million dollars. Should the Grand Trunk be willing to go in with the other two roads on the project, it would save that railway the difficulty it now faces with its Queen street level crossing, as it would mean that all three railways would enter the city from the east over the one trackage, consisting of four parallel tracks.

Mainly Constructional

The News in Brief—From Coast to Coast

A big flax mill is to be erected at Moose Jaw at a cost of $750,000.

Five new bridges are to be built in Pontiac County, Que., to replace those which were recently swept away by floods. The new bridges will be raised much higher than the old ones.

At Regina, building permits for the month of April approximated $335,000.

Building permits in West Toronto for the month of April amounted to $305,000.

Contracts have been awarded for the erection of a new public school at Humboldt, Sask. The total cost of the building will be $61,000.

Thirty thousand dollars is the cost of a cleansing plant which the city of Edmonton will construct at the First street outfall of the sewer system.

Owing to the inability of the contractors to get steel for the structural work, Toronto's civic abattoir will not be finished until about February of next year.

The Lyall-Mitchell Company have been awarded the contract for the erection of the Grand Trunk Pacific hotel at Regina. The building will cost $1,000,000.

Good progress is being made on the construction of the new sugar refinery at St. John, N.B., and it is expected that it will be in operation in about twelve months.

It is of interest to note that the ratepayers of the city of Winnipeg have approved a by-law to raise $1,150,000 for the erection of a subway under the C. P. R. tracks.

A five-storey warehouse, 50 by 150 feet, costing $110,000 is to be erected at Edmonton. It will be of mill construction with facings of cut stone and pressed brick.

The new Athelma apartment house, Grosvenor street, Toronto, will be opened in a few weeks. It contains 458 rooms divided into 76 suites and cost $300,000 to build.

Building permits issued at Regina to date aggregate in value $1,401,345, compared with $1,092,525 for the first four months of 1912. Mr. O. T. Falls is the building inspector at Regina.

The Rosthern Brick Company, Rosthern, Sask., are enlarging the capacity of their plant and installing new machinery. The company have orders on hand for over one million brick.

Messrs. Smith Brothers & Wilson, of Saskatoon, have been awarded the contract for the erection of the new public school in Battleford. The school will contain twelve rooms and will cost $75,000.

Mr. Thomas Turnbull, Building Inspector of New Westminster, B.C., reports building permits, January to April, of a total value of $451,610, as compared with $518,448 for the corresponding period of 1913.

The Metallic Roofing Company, Toronto, have had plans prepared for a 2-storey addition to their factory at King and Dufferin streets. The estimated cost is $12,000. Messrs. Curry & Sparling are the architects.

At Lethbridge, Alta., there is a slight falling off in the building permits for the period of January to April, as compared with 1912. The figures are $315,103 and $449,505. Mr. H. W. Meech is the Building Inspector.

The Burrell Engineering and Construction Company, of Chicago, has been awarded the contract for the erection of the Western Terminal elevator in Fort William and work on the foundation has been already commenced.

The Consolidated Building and Supply Company was recently incorporated at Toronto with a capital of $250,000. The company has acquired property in the northern and eastern parts of the city and will erect dwellings.

The rapid growth of the city of Vancouver and other coast cities during the last few years, and the replacing of older buildings by modern structures, has created a very large demand for good building brick, of better quality than has hitherto been obtainable in British Columbia. To meet this demand, the Heaps Brick Company, Limited, has erected a modern plant at Ruskin, a station situated on the main line of the Canadian Pacific Railway, about 30 miles east of Vancouver. There is an unlimited supply of good clay at this point.

The following percentage of increases is shown in building permits for the first four months of 1913, as compared with the same period of 1912. Peterborough, 367; London, 120; Kingston, 92; Welland, 57; Toronto, 42; Ottawa, 37, and Hamilton, 29.

Mr. J. B. Griffith, Secretary-Treasurer of the Edmonton Portland Cement Company announces that the company's 1,500-barrel mill at Marlborough, Alta., will be in operation on June 1. The output for the first year has been sold to dealers in Edmonton.

The Cuthbertson Realty Company, Limited, has been incorporated at Toronto with a capital of $300,000, the larger part of this sum having been subscribed in England. The headquarters of the company will be at Fort William where they will build a number of houses.

Permits for buildings estimated to cost more than $2,250,000 were issued in April at Edmonton, as compared with $2,002,670 the same month a year ago. One permit was for the George Brown Building, a ten-storey structure at Jasper avenue and Second street, to cost $600,000.

C. W. J. Haworth, city food inspector, has sent a letter to the council of Edmonton, recommending the establishment of a public abattoir and union stock yards. The plant, it is estimated, would cost between $50,000 and $75,000. The plan has been referred to the industrial committee.

Sand and Supplies, Limited, Toronto, have recently issued an attractive calendar showing photographs of their pits at Ayr, Ont., and illustrating their methods of loading cars on their sidings. The company are building additional sidings to enable them to handle the ever-increasing demand for their sand and gravel.

The building permits isued at Montreal during the first four months of 1913 represented a total value of $5,190,253. This compares with $3,745,180 for the corresponding period of 1912. The April totals were $3,322,406 and $2,314,021. Mr. Alcide Chausse is Superintendent of Buildings for the city of Montreal.

An original method is being employed to dismantle the St. Charles building at Toronto. This consists of a long chute reaching up four storeys into which the rubble and bricks are placed. The most novel feature of the method is having a man to stand on the hinged door of the chute, to check the bricks and plaster in their fall.

North Battleford, Sask., which was a village in 1905, and a town in 1910, was incorporated as a city on April 30th. The growth of North Battleford is attributed primarily to railway development. It is now the fifth largest city in Saskatchewan. A campaign for a new name is suggested, there having been confusion with the town of Battleford on the south side of the river.

The Quebec Government have received over three hundred applications from municipalities wishing to take advantage of the Good Roads law. About 75 municipalities have gone through the necessary formalities to obtain grants for improving their highways, the sum required for these demands being in excess of $3,000,000. The majority of the requests have been received from the district of Montreal and from the Eastern Townships.

The Northern Club of Edmonton has accepted plans, drawn by Messrs. Magoon & MacDonald, for a seven-storey building, 50 by 150 feet, costing $250,000, to be erected at Second and Victoria streets. The Carmichael Construction Company has the contracts for the foundations, basement and footings. It is given out that work on the superstructure will begin this season, so that the building may be completed early in 1914. The Kahn system of reinforced construction will be employed.

The Southern Ontario Gas Company, Limited, has been incorporated at Hamilton with a capacity of $15,000,000. Practically all forms of gas manufacturing are arranged for with a view to extensive exploitation of by-products, as well as the natural or artificial gas. The whole of western Ontario, including the Counties of Essex, Kent, Middlesex, Elgin, Brant, Wentworth, Lambton, Norfolk, Welland, Haldimand, Lincoln, Oxford, Waterloo and Wellington, will provide a market for the products, and arrangements are made for prospecting and refining of all the gas and petroleum obtainable.

A new club with the title of the Technology Club of Lower Canada has been formed in Montreal. The main object is to bring together former students of the Massachusetts Institute of Technology for the purpose of social and mutual advantage, and to promote the interests of the institution. A weekly luncheon will be held, and the Club will also have two regular half yearly meetings. At the inaugural meeting held last week the following officers were elected: President, Mr. F. E. Came, '81; vice-president, Mr. H. E. Stearns, '81; secretary-treasurer, Mr. E. B. Evans, '06; board of governors, Mr. D. J. Spence, '97; and Mr. G. R. Heckle, '99.

The work of repairing the asphalt pavements in Toronto is becoming a rather serious problem for the City Engineer. It has been found a very difficult matter to carry on the repair work during the daytime, when traffic is heavy and when much damage is done to newly repaired pavements. To remove this difficulty the City Engineer's Department has decided to do more repair work at nights. The interruptions will be less frequent, and the passing of vehicles over newly repaired pavements will be done away with. It is also the intention of the City Engineer to effect an economy by instituting a system of quick repairs. This will be done by purchasing small plants for repairs that can be quickly moved from one part of the city to the other, and which will be used to repair pavements when the first evidence of the need for repair is manifest.

Construction work will be rushed on the Hudson Bay Railway at Le Pas. A train of cars loaded with working equipment was recently sent there from Winnipeg and about 250 men will be employed at the start, but many more will be taken on later in the season.

The Structural Steel Company, Limited, Montreal, are engaged on some work at the C. P. R. Angus shops extension. The company have erected the steel work for a passenger and freight car erecting shop, and during the summer will build an outside crane runaway in connection with the shop, and also a bolt and nut shop. During the fall the company will erect the steel for an extension to the locomotive shop.

Personal Mention

Dr. Rudolph Hering, of the firm of Hering & Gregory, consulting engineers, left New York City on May 7th for Winnipeg and western points.

Messrs. Cummins & Agnew, a firm of consulting engineers, recently organized at Vernon, B.C., have been appointed city engineers of that municipality.

Mr. E. Brydone-Jack, Professor of Civil Engineering, University of Manitoba, has opened an office as consulting engineer at 305 Boyd Building, Winnipeg.

Mr. W. G. Trethewey, Toronto, has been appointed a delegate by the Ontario Motor League to the Third International Road Congress, to be held in London, England, in June.

Mr. F. W. Simon, architect for the new Provincial Government building at Winnipeg, arrived there recently. He stated that specifications for the new buildings were being prepared and that tenders would be called for immediately.

Mr. R. O. Wynne-Roberts, the principal author of the article on Storm Water Discharge, reproduced elsewhere in this issue, came to Canada in July, 1910, to report on the water supply of the city of Regina. His recommendations, since adopted, involved an outlay of $2,000,000. Since then Mr. Wynne-Roberts has made a number of other important reports on water supply. Recently he reported to the Saskatchewan Government on large power schemes from the lignite coal fields. Mr. Wynne-Roberts has had extended experience in many parts of the world. As city engineer of Cape Town he was in charge of a large waterworks scheme which involved the expenditure of $8,500,000. He is the author of several books and is a well-known contributor to the technical press. He is a Member of the Institution of Civil Engineers and a Fellow and Examiner of the Royal Sanitary Institute. Mr. Wynne-Roberts has always taken an active interest in Society work. He was one of the founders of the Cape Society of Civil Engineers, and the Regina Engineering Society owes its existence almost entirely to his efforts.

Mr. R. O. Wynne-Roberts, Regina.

Mr. V. J. Melsted, resident engineer of the C. P. R. at Brandon, has been promoted to the head of the chemistry department at Winnipeg, attending particularly to that portion appertaining to engineering. Mr. H. B. Lake, who has been chief chemist for many years has resigned to go to England.

Mr. E. H. Darling, formerly Assistant Engineer of the Hamilton Bridge Works, Hamilton, Ont., has become a member of the firm of McPhie, Kelly & Darling, architects and engineers, Toronto. Mr. Darling is a graduate of Toronto University and for several years has been in charge of the drafting department of the Hamilton Bridge Works.

Mr. Colin F. Gillies, for some years manager in Western Canada for the El-Oso Paving Company, has severed his connection with that firm and has started in business on a considerable scale in builders' supplies and similar lines at Saskatoon. Mr. Gillies is a native of Nova Scotia, and is a practical contractor and engineer, having followed that industry in a number of different cities in the United States and Canada for a period of ten years. Previous to taking the management of the El-Oso Paving Company, he was engaged in general contracting in Vancouver for two years. His lines will include freight and passenger elevators, concrete machinery, railway supplies, mill-work, hardwoods, lime, plaster, brick, cement structural steel, sewer pipe, various lines of tile and similar commodities required in building and construction work. One of the agencies carried by Mr. Gillies will be the Seagraves' fire engines and apparatus, which he will represent in the Saskatchewan territory. The firm name is Colin F. Gillies & Company, and their address is Suite 122, Willoughby-Sumner Block, Saskatoon.

F. P. Gutelius to Manage Government Railways

Mr. F. P. Gutelius has been appointed sole commissioner of the Intercolonial and Prince Edward Island railway lines. The appointment is made to replace the Board of Management that has had charge of the direction of the system.

In the Board as heretofore constituted, Mr. A. W. Campbell, as Deputy Minister of Railways, was chairman. He will continue as Deputy Minister, but will not be directly connected with the administration of government railways.

Mr. F. P. Brady is at present in charge of the operation of the line. Mr. E. Tiffin is the traffic superintendent. Mr. D. Pottinger the Superintendent of Finances, and Mr. J. B. T. Caron, the legal member of the Board.

All these positions are to be abolished, though certain of the officers will continue as assistants to Mr. Gutelius. The latter, however, will be the whole authority, inasmuch as he will be responsible to the government for the management and operation of the line.

The new Commissioner is recognized as one of the ablest railroad men in the country, having had experience in the construction and operation of railways. He was formerly superintendent of the Canadian Pacific Railway at Montreal, and previous to that held many responsible positions on the same system. For the past year and a half he has been a member of the Commission investigating the construction of the National Transcontinental Railway. That inquiry is about completed, and Mr. Gutelius will be able to enter upon his new duties very shortly.

The system of having one Commissioner has worked admirably in connection with the Transcontinental line which soon after the advent of the present government to power was placed under the sole directorship of Major R. W. Leonard.

By the leasing of branches designed to serve as feeders, the government plans for a wide extension of the activities of the Intercolonial in the eastern provinces, and Mr. Gutelius is regarded as well fitted for the direction of development of Canada's State system of railways.

Management of the Geo. B. Meadows Company Celebrates Coming of Age

The Geo. B. Meadows Toronto Wire, Iron & Brass Works Company, Limited, recently celebrated the 21st anniversary of their business under the present management. The firm began in a small way under the direction of Mr. Geo. B. Meadows, with a working staff of six men and boys. Their activities have increased until at the present time there are sixty-five names on the payroll. The business was conducted on King street for a period of thirteen years, after which the plant was removed to Wellington street west, the present location. The first factory on Wellington street had a working space of 4,000 square feet and the plant has been enlarged from time to time until now there is a productive area of 20,000 square feet, provision being made for the fabrication of wire work, metal lockers, bank and office fittings, and architectural iron work, each of the several departments being equipped with the most modern machinery.

The policy of the company has always been to provide light airy workrooms for the employees, this being regarded as a fundamental in efficient production.

We reproduce herewith a photograph of Mr. Clifford A. Meadows, Designing Engineer with the Geo. B. Meadows Company. Mr. Meadows is a native of Toronto and a graduate of the S. P. S. His earliest experience was obtained in the shops of the Geo. B. Meadows Company. After graduation he spent two years with the Dominion Bridge Company of Montreal, there obtaining a valuable insight into the work of the detailing office, the designing office and the shop inspection staff. In the last-named connection it is of interest to learn that Mr. Meadows was retained for the inspection of the steel work in the Toronto head office building of the C. P. R., described in our Annual Number of April 30 and in our Toronto-Featured Number of November 27, 1912.

Mr. Clifford A. Meadows, Designing Engineer, Geo. B. Meadows Company.

The brick business formerly carried on by Messrs. Bechtels, Limited, Waterloo, Ont., has been sold and in future will be carried on under the name of the Waterloo Brick and Tile Company. The property comprises over fourteen acres and the present capacity is 20,000 bricks per day. The new proprietors intend to double the capacity.

The American Steel & Wire Company, Chicago, have issued a new book on the use of triangle mesh reinforcement in the building of concrete pavements and roadways. This book contains a comprehensive and practical description of the construction and as such it cannot fail to be received with interest by all those identified with road work. A simple definition of the system is the combining together firmly of the concrete roadway and a layer of triangle mesh wire reinforcing fabric, which prevents cracks forming. The steel mesh imparts its strength evenly to the concrete. The book is illustrated with excellent half-tones and its value is enhanced by the cost data throughout.

Mr. James J. Martindale announces that the office of the Tuec Air Cleaning System has been moved to the "B. O. T." Building, 159-61 Richmond street west, Toronto. The Tuec stationary air (vacuum) cleaners will be manufactured at this location for the Canadian trade.

"The Mixers that Make Money" is the title of a condensed catalogue of machinery manufactured by the Waterloo Cement Machinery Corporation, of Waterloo, Iowa. This booklet is well illustrated and contains practical information calculated to acquaint the trade with the company's products and to aid in the selection of mixer equipment best adapted to individual requirements.

The annual statement of the National Brick Company, Laprairie, P.Q., was submitted at the annual meeting on April 21. The statement, which is for the year ended February 28th, 1913, shows gross earnings for the year of $396,731.93 and net profits, after payment bond interest, dividends on old Laprairie stock and administration expenses, of $255,196.17, equal to 12¾ per cent. on the total outstanding capital stock of $2,000,000. During the coming year, with the plants in full operation, it is expected that the total output will exceed 135,000,000 bricks.

Publications Received

Asphalt Construction, by Clifford Richardson. Published by the McGraw-Hill Book Company, New York City; price $2.00 net. The purpose of this book is to show the possibilities of this type of work under the best methods of procedure. The author's observations are based upon experience extending over thirty-five years, beginning in 1878 with the original Trinidad sheet asphalt surface laid on Pennsylvania avenue, Washington, D.C., and in 1879 on Vermont avenue of that city, which is still in existence to-day. The author is fully convinced as to the lasting qualities of good asphalt when satisfactorily manipulated. Professor Richardson endeavors in this handbook to give in detail a practical statement of the procedure which to his own personal knowledge has proven most satisfactory in London, Eng., and in cities of the United States. The character and extent of modern traffic has created a demand for skilled highway engineers, contractors and inspectors. By all identified with this field, this little work should be appreciated.

Specifications for Street Roadway Pavements, by S. Whinery. Second edition, revised and enlarged, published by the McGraw-Hill Book Company, New York City; price $1.00 net. City engineers and municipal authorities will doubtless welcome this set of specifications for standard street pavements. The book constitutes an exceptionally handy reference to the main points that should be covered in the various specifications for sheet asphalt, asphalt block, granite block, brick, wood block, bituminous and hydraulic concrete. In order to widen the range of the specifications, copious footnotes have been added, referring to alternative requirements and methods of construction [illegible] the reasons for the preference or adoption of the construction called for in the specifications. Appended is a general code of instructions for inspectors on street paving and incidental work.

An Up-to-date Brick Industry at Quebec

The Plant, Manufacturing Facilities and Equipment of The Citadel Brick and Paving Block Company, Limited

THERE is no doubt in the minds of those in a position to judge that Quebec, the city of historic associations and past glories, is feeling an impulse of new life and is awakening to new activities.

The most superficial observer cannot fail to see evidence of this wherever he turns, this evidence being nowhere more strikingly shown than in the scores of new and unfurnished houses dotted over the newer parts of the city. Quebec is spreading into what for many years has been farming land, and on this account land values outside the city have taken an unsuspected value.

Round kiln at the Citadel brick plant, Quebec.

Of course such extensions create a very large demand for all building materials, and especially for brick of superior quality. Heretofore this has been imported from other parts of Canada, the United States and Scotland, but during the last year there has come into existence a brick plant which will soon have sufficient output to supply all the demand for face brick in the market. This is the plant of The Citadel Brick & Paving Block Company, Limited.

The material used is Utica Lorraine shale, found at Boischatel, on the line of the Quebec Railway, Light, Heat & Power Company, a mile below Montmorency Falls and about seven miles from Quebec.

The Company's plant covers a large area, more than a third of a mile in length, along the bank of the St. Lawrence River, and could not be better placed for both rail and water shipping facilities. The shale bank, which rises to a height of nearly two hundred feet, is situated advantageously for the purpose of mining, and the supply of material is practically unlimited. Mr. Obalski, the well known engineer and geologist (for a number of years in charge of the Department of Mines of the province of Quebec), calculates the quantity in three of the six properties owned by the Citadel Company at one hundred million cubic feet—sufficient material to produce one hundred thousand bricks a day for a hundred years.

The shale produces a very fine quality of face brick, paving block and fire-proofing. The face brick shades run from a beautiful pink to a splendid buff and a handsome brown. The bricks already sold have met with much favor among architects, contractors and builders of homes. The shale has been tested in the United States and England, and in the testing laboratories of the German Government at Berlin, and has proved its adaptability to the manufacture of bricks and other clay products. Some of the first bricks manufactured were subjected to the most severe frost and absorption tests and demonstrated their extreme hardness and durability.

Fine samples of paving blocks have already been turned out and the Company intends to make this product on a commercial basis.

The manufacturing process—a camparatively new one in Quebec—is known as the stiff mud or plastic process, requiring the installation of far more expensive and elaborate machinery, drying and burning outfits than are found in the ordinary brick-yard.

The shale is first ground in a large grinding pan and then conveyed to the pugging machine. The addition of water and the process of pugging here prepares the clay for the brick machine, through which the now plastic clay is forced by an auger in the machine. The clay emerges from this machine in the form of a column and is then cut into bricks by an automatic cutter. The bricks are taken from a belt, which conveys them from the cutter, and are placed on steel

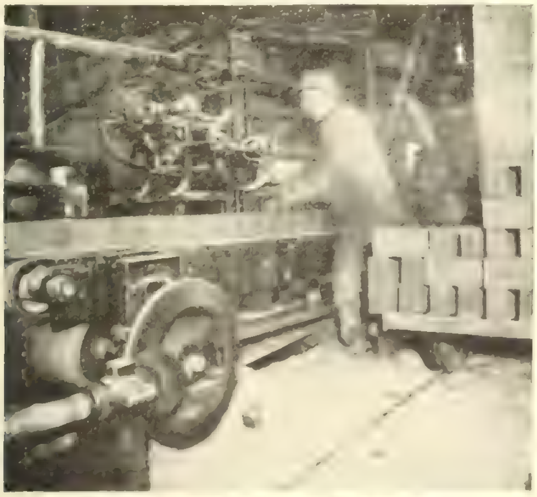
Brick cutter and repress.
Grinding shale in dry pan.
Citadel Brick and Paving Block Company's Plant, Quebec.

drying cars, and run on tracks into the dryer, where the bricks are dried at a temperature of 150° to 250° Fahrenheit. After they are thoroughly dried they are taken to the kilns and burned.

The present kilns are of the round down-draft type and have a capacity of 65,000 each. They are permanent kilns, built of red brick, with fire-brick lining, and having walls three feet thick. East of Toronto there are few kilns of this type in Canada.

Clay column emerging from brick machine.

The present mechanical equipment consists of one rock crusher; one Stevenson 9 ft. dry pan; one Rand drill and compressor; one 125 h.p. and one 150 h.p. motor; one 14 ft. Freese pug mill; one Freese machine and cutter; one Richardson repress. To these will probably be added during the coming summer another dry pan and brick machine, then a continuous kiln of the Hoffman type with a capacity of 50,000 bricks a day.



Placing green bricks on dryer cars

The manufacturing is under the direction of Mr. Otto Pommer, a German brick-making expert, who has had much experience, both in his native land and in the United States. Mr. Pommer superintended the construction of the plant.

The original promoters of the Company, Mr. G. B. Ramsey, Director of the Macpherson Company, Limited, and Mr. Arthur Laurent, President of the Canadian Fireproofing Company, after a long series of experiments and tests, covering a period of five years, organized the company, with the following directors: Hon. S. N. Parent, president; Mr. G. B. Ramsey, vice-president; Messrs. W. M. Macpherson, Arthur Laurent, J. E. A. Dubuc and G. E. Tanguay, directors. Mr. F. C. Thorn is secretary-treasurer and manager.

A Great Industry at Hamilton, Ont.

An industry of enormous proportions is that controlled by the Steel Company of Canada, Limited, which has its headquarters at Hamilton, with works and factories in several other cities, and agencies and branches all over the Dominion. The Company was incorporated in June, 1910, under the Dominion Companies Act, and has an authorized capital of $25,000,000 of which $10,000,000 is preferred and $15,000,000 common stock. This Company owns and operates the plants of the following concerns:—The Hamilton Steel and Iron Company, Limited, The Montreal Rolling Mills Company, Canada Screw Company, Limited, Dominion Wire Manufacturing Company, Limited, and The Canada Bolt and Nut Company, Limited. The plants are situated at Montreal and Lachine in the Province of Quebec, and at Hamilton, Toronto, Brantford, Belleville, and Gananoque, in the Province of Ontario. In these works the company produces pig-iron, open-hearth steel, bar iron and steel and shapes, forgings, locomotive and car axles, track spikes, bolts, nuts, rivets, horseshoes, wrought iron pipe and fittings, wire and cut nails, tacks, wood screws, and other screws of all kinds, iron, steel, brass, copper and bronze wire, and various products thereof. The Steel Company's sales to the public amount to over $15,000,000 annually, and it has in constant employment about 6,000 hands, an annual pay-roll of nearly $4,000,000.

The directors of the Steel Company are: Sir Edmund Osler, M.P., Messrs. Charles Alexander, Cyrus A. Birge, Hon. Wm. Gibson, Lloyd Harris, F. H. Whitton, Robert Hobson, W. D. Mathews, John Milne, William Southam, and Charles Seward Wilcox. Mr. Wilcox is president of the company, and the other executive officers are: Vice-president, Cyrus A. Birge; vice-president and general manager, Robert Hobson; assistant general manager, F. H. Whitton; secretary and treasurer, H. H. Champ, assistant treasurer, H. S. Alexander; assistant secretary, Corbett F. Whitton.

Interesting Exhibit at Toronto Business Show

One of the interesting exhibits at the recent Business Show, at Massey Hall, Toronto, was that of the Tuec Stationary Air Cleaners. These cleaners are exceptionally simple in principle having only two bearings, and both being ball. They move a very large volume of air per horse power expended which means greater cleaning efficiency at reduced cost of energy.

The piping used is large, 2½ in. in diameter, thus preventing clogging troubles and allowing big volume of air delivery at the point desired, namely the tool.

The tools are of exceptionally large size and, according to the demonstration noticed at this exhibit, will pick up any substance of size small enough to enter the large apertures of the tools and hose. By the application of an old principle, the dirt and dust is separated from the air without the use of a cloth sack, the elimination of which is a great event in the art of vacuum cleaning and appeals to all practical and medical men.

Three machines were shown at the exhibit, Nos. 170, 200 and 400, the two smaller machines being applicable to home use, while the larger machine is one that might be used in office buildings, apartment houses, bank buildings, schools.

The manufacturers (The United Electric Company) have thirteen sizes and 264 styles. This complete line will be manufactured at their new factory, 159-161 Richmond street west, Toronto, for the Canadian trade.

The Chain Belt Street Paver

After three years of constant study and application of the street paver problem, the Chain Belt Company, Milwaukee, Wis., now have ready for distribution the Chain Belt street paver. This machine is of practically the some general design as the standard side discharge Chain Belt mixer. The street paver has a Chain Belt drive, cast semi-steel bulge drum, chilled rollers with bronze bushings, all steel frame, etc.

This machine was especially designed for laying concrete pavements, but it can be used for any class of work and is well adapted for mixing concrete for bridge abutments, etc. It is provided with a reversible traction drive so that the mixer can be moved forward or backward by its own power. The traction drive is fitted with a friction clutch, and to move the machine ahead it is only necessary to throw in the clutch, and to stop the machine, throw out the clutch. The traction drive is connected to both rear wheels and is sufficiently powerful to propel the machine up an incline of 15 degrees. The front axle is of the automobile steering knuckle-joint type, and the rear axle is a compensating differential. The latter is advantageous in that it will equalize the speed of the rear wheels in turning corners. The wheels are heavy crucible steel castings, 9 inches wide.

No platforms or runways are required and if the material is placed sufficiently close to the machine it can be shoveled directly from the supply pile to the open end power loader bucket. All levers are so arranged that one man can operate the entire machine if necessary. The operator stands on a platform on one side of the machine, about 30 inches above the ground, and can operate the power loader, water tank, discharge and boom. The Chain Belt paver is capable of turning out a batch of concrete in 45 seconds.

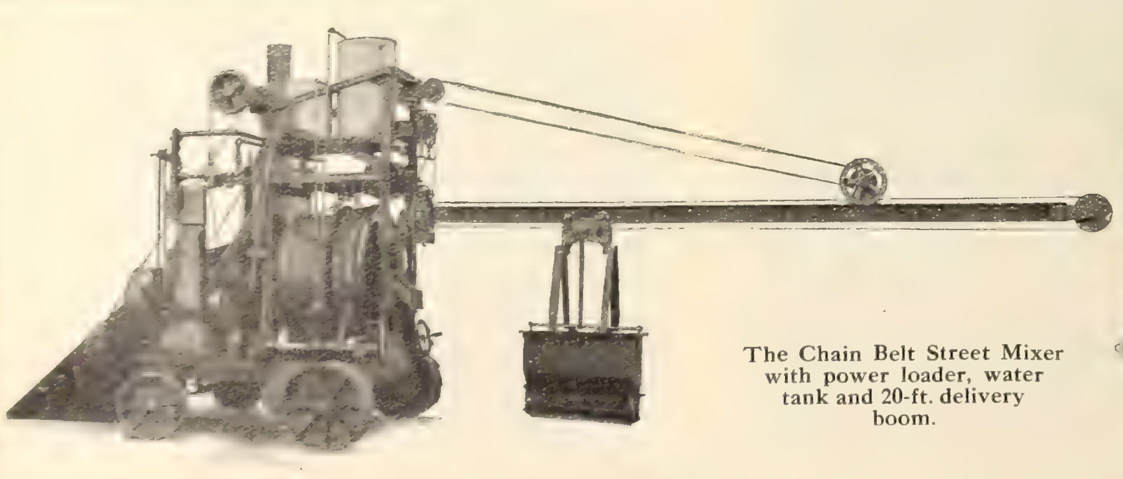
Concrete Distributing Boom

The Chain Belt street paver is equipped with a boom 20 feet long and delivery bucket. Paving contractors have found this the most economical method of spreading concrete on streets as it eliminates the use of wheelbarrows and carts.

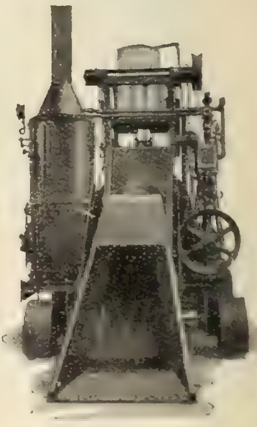
The concrete is discharged from the mixer into the delivery bucket, which travels on a single boom. The boom can be swung at an angle of 180 degrees, and a street 50 feet wide can be easily taken care of. The boom bucket will hold a full batch of the mixed concrete and is provided with an automatic tripper. The gates open up automatically at any place where it is desired to deposit the concrete. When the bucket returns to the mixer, the gate closes automatically. The same man who operates mixer levers also controls the movement of the boom and bucket.

In work where the road is less than 18 feet in width a gravity swivel chute may be substituted for the distributing boom.

The Chain Belt Paver is made in three sizes:—10, 15, and 23 feet respectively. The No ten weighs 11,000 lbs., the No. fifteen 14,000 lbs., and the No. twenty-three 17,000 lbs.



The Chain Belt Street Mixer with power loader, water tank and 20-ft. delivery boom.



Charging side of street mixer.

The Canadian Sirocco Company, Limited, Windsor, Ont.

FOR several years prior to the incorporation of this Canadian industry, the directors of the American Blower Company had been considering the establishment of a Canadian branch factory.

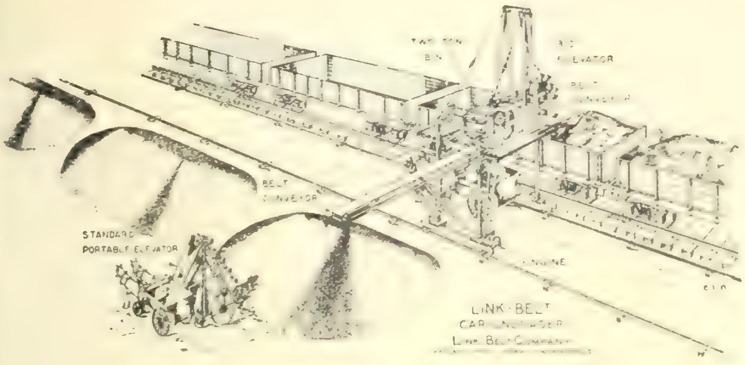
While the American Blower Company enjoyed an enviable reputation for their products, the growing attitude for "Made-in-Canada" apparatus made the selling of United States products difficult and expensive, and the volume of sales unsatisfactory in proportion to the market.

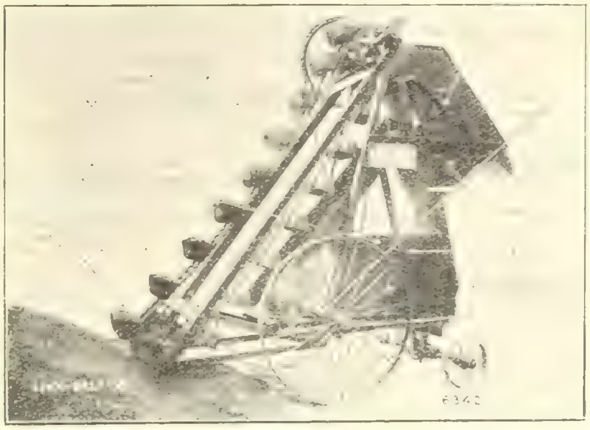
Canadian Patent requirements making it necessary to manufacture Sirocco Fans in the Dominion in order to obtain fullest protection, this seemed sufficient reason in itself for building a branch plant.

The plant of the Canadian Sirocco Company, Limited, at Windsor, Ont.

On October 2nd, 1911, the Board of Trade of the City of Windsor, Ont., solicited the location of a branch plant within their boundaries, offering inexpensive property and other inducements. The time seemed ripe for more serious contemplation of a Canadian branch than the subject had previously been given, and the Secretary of the Board of Trade was interviewed, sites in the new factory district of Windsor were visited, and a location was selected, the property consisting of 3.82 acres on the Essex Terminal Railway.

Windsor was decided upon as the logical location for





the Canadian plant, on account of its geographical location and its close proximity to the Executive Offices and Engineering Department of the American Blower Company, and it was decided to proceed with the project. Catering to the sentiments of the country, a distinctly separate Canadian Company was projected, and on November 18, 1911, Charter was applied for to do business under the Ontario Companies Act, with the corporate name of Canadian Sirocco Company, Limited. This Charter was granted on the 23rd day of the same month.

Plans had been prepared for the first of the proposed group of factory buildings to be erected, and on December 29th, 1911, contracts were let with the Canadian Frost Winchester Company, Windsor, and the Canadian Bridge Company, of Walkerville, for a steel and brick erecting shop 50 ft. x 208 ft. The construction work proceeded during the extremely severe winter weather and many delays were experienced.

On April 4th, 1912, the contractors were ready to erect the north end of the building, when it was decided to add 96 feet to the length of the building to make more room for manufacturing. The additional space was thought necessary on account of the purchase of large new machinery in addition to the number of machine tools purchased from the American Blower Company.

The first shop workman was employed May 9th, 1912, as a millwright for the installation of boiler and machinery.

During the construction of the plant a small office was maintained in Curry Hall, Windsor. On June 1st, 1912, this was vacated for temporary office space in the front of the factory building.

There were many delays in getting the extension completed and machinery installed, so that it was September 2nd before the power plant was started and machinery run. Two days later a carload of piping for Fisher Body Company's dry kilns at Walkerville was shipped. The first Sirocco Blower to be produced at Windsor was a No. 14 Induced Draft Fan for the Riordon Paper Company, of Hawkesbury, Ont. At the same time one of three large heating outfits for the Lake Superior Paper Company, Sault Ste. Marie, was being produced. This went forward on September 30th. Since early in May, sales solicitation had been actively carried on and a number of important contracts secured.

On December [illegible] shop pay-roll. The agreement with the city of Windsor, stipulated the steady employment of at least twenty-five men.

The Canadian Sirocco Company's December shipments alone nearly equalled the entire previous year's sales of the associated company.

The Link-Belt Portable Wagon Loader

Illustrated herewith is the latest device for loading crushed stone, sand, gravel, broken macadam, coal, pyrites, etc. It is called the Link-Belt portable wagon loader and is manufactured by the Link-Belt Company, of Philadelphia and Chicago.

The portable wagon loader has revolutionized the method of loading wagons and railroad cars.—It will load coal at the rate of 60 tons an hour, and crushed stone at 35 to 40 tons an hour. It has been used by prominent coal companies in the Eastern and New England States for the past two years with the greatest success. Contractors throughout the country are finding extensive use for these machines for road work as well as for handling stone, sand and gravel.

The Wagon Loader is fully described in the Link-Belt Company's new catalog No. 10, a small illustration of which is shown herewith. Copies will be mailed to anyone addressing the Link-Belt Company at Philadelphia, [illegible]

The Federal Department of Public Works is establishing offices in Fredericton for the District Engineer and staff in charge of the department's work on the St. John River and its tributaries in New Brunswick. The reason for removing the offices from St. John to Fredericton is that advantage may be taken of the most central location available and hereafter all the work of the Federal Department of Public Works, the dredging, construction of wharves, etc., will be carried on from this city.

The Canadian Stewart Company has been awarded the contract for a 4,000,000-bu. extension to Grain Elevator D at Fort William, Ont., for the Canadian Pacific Railway.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Dunnville, Ont.

Tenders will be received by Chairman, H. L. [illegible], until May 31st, for laying 100,000 ft. water mains. Material supplied by Town. Specifications at office of Supt. Waterworks Comms., Robt. [illegible]

Goderich, Ont.

Pavements on Anglesea street and Brittania road, planned by the town council. Clerk, L. L. Knox.

Hamilton, Ont.

Water mains contemplated on Alexander, $368; Macallum, $860; Cluny, $1,036; Craigmiller avenue, $1,036; Dalkeith avenue, $1,036; Dalhousie avenue, $1,036; Rosslyn avenue, $1,304; Sunset avenue, $424; St. Ann, $400; Barton, $368. Mayor, John Allan. Engineer, A. F. Macallum. Work to be done by city.

Waterworks improvements, cost $150,000, contemplated. Mayor, John Allan. Engineer, A. F. Macallum. Council passed by-law to raise above sum, which includes $1,000 for new hydrants, $50,000 for services and $10,000 for meters and installation.

Kentville, N.S.

Water system extension, cost $15,000, planned by town council. Clerk, J. Carroll.

London, Ont.

Council plans to lay asphalt pavements on a number of the main roads leading out of the city. Estimated cost $25,000. Mayor, C. M. R. Graham. Engineer in charge, W. N. Ashplant.

Montreal, Que.

Verdun Town Council plan construction of sidewalks. Engineer, H. Hadley, Jr., City Hall. Material required.

Tenders received by Board of Commissioners until June 12th for a 1,000,000 gal. elec. pump for Waterworks Department. Plans and specifications at office of Superintendent. Secretary, L. N. Senecal, City Hall. Engineer, T. W. Lesage, Superintendent of Waterworks.

Sidewalks contemplated by town council of Outremont. Sec.-Treas., E. T. Sampson. Engineer, Mr. Duchastel. About 9 miles concrete sidewalks to be laid this year. Tenders will be called.

Verdun council has authorized that water mains for 3 streets shall be purchased as soon as finances allow. Engineer, H. Hadley, Jr., City Hall.

Sewers, contemplated by town council of Outremont. Sec.-treas., E. T. Sampson. Engineer, Mr. Duchastel. To be built this year. Tenders will be called.

Ottawa, Ont.

Asphalt pavement on Clarence street from Charlotte and Augusta streets contemplated. Mayor, J. A. Ellis. Engineer-in-charge, F. C. Askwith, Acting City Engineer.

Petrolia, Ont.

Paving. Town council plan to lay a number of new roadways and will meet shortly to select material. Clerk, J. H. McHattie.

Winnipeg, Man.

Waterworks scheme, cost $7,000,000, contemplated by Board of Control. Secretary, M. Peterson. Engineers, Stearns, Herring & Fuertes. By-law for erection of "Greater Winnipeg Water District" passed by ratepayers on May 1st, 1913.

CONTRACTS AWARDED

Berlin, Ont.

Trunk sewer planned by city council. Clerk, A. H. Miller. City engineer, Herbert Johnston. Contract for 11,913 lin. ft., 48 in. reinforced concrete tile, awarded to Francis Hankin & Company, Mail Building, Toronto, $35,143.75. For laying 48 in. and 30 in. pipe, Henry Morris, Frankford, Indiana, $30,504.37.

Hamilton, Ont.

Sewers on High, King and Cumberland streets to be built by city, day labor, $4,173, and on Burlington, Columbia Ave., Park Row and First Ave., awarded to J. D. Armstrong, 138 Erie avenue, $4,637. Mayor, John Allan. Engineer, A. F. Macallum.

Montreal, Que.

Paving blocks, cost $95,000. Engineer, Geo. Janin. General contractors, Elder Elbans Asphalt Company, Limited, 206 Quebec Bank Building.

Ottawa, Ont.

Asphalt pavement, cost $10,000, Powell avenue. Mayor, J. A. Ellis. Acting city engineer, F. C. Askwith. General contractors, Ottawa Construction Company, Central Chambers. Pavement, Bank to Lyon, curb and gutter, gutter headers.

St. John, N.B.

Waterworks supplies, cost $8,700. Commissioner, R. Wigmore. Engineer, Wm. Murdock, City Hall. General contractor, John Birch & Co., London, Eng. 300 tons pipe.

St. Thomas, Ont.

Waterworks standpipe. Mayor, E. N. Price. Engineer, M. Ferguson. General contractors, DesMoines Bridge & Iron Co., Pittsburg, Pa., $24,700. Steel construction.

Railroads, Bridges and Wharves

Brandon, Man.

Tenders received by Sec.-Treas., D. W. Shaw, till May 16th, 1913. For the erection of 2 bridges across the Little Souris River, 1 between Secs. 9 and 10, Twp. 9, Rge. 18 Brandon Hills. The other between Secs. 17 and 20 Twp. 9 Rge 17, Glen Souris. Plans, specifications, etc., at Dept. Public Works, Winnipeg and City Hall, Brandon.

Calgary, Alta.

C. P. R. Co. has been authorized to construct spur for General Supplies Ltd., in city of Calgary.

Cobourg, Ont.

C. L. O. & W. Rly. (C. P. R.) Co. has been authorized to construct bridge across Burnham street, Cobourg, at mileage 120.74 from Glen Tay.

Dana, Ont.

C. N. O. Rly. Co.'s location of station at Dana, Twp. Crerar, Dist. Nipising, Ont., at mileage 275.8 from Ottawa, has been approved.

Dundas, Ont.

Cockburn Lumber & Concrete Company, Colborne street, plan laying 12 separate tracks from kiln to dry rooms, 60 lb. rails.

Edmonton, Alta.

Railway extensions, cost $50,000, planned by city council along the Fort Trail to the Belmont School and traversing the length of Douglas street (about 3 miles in all). Two Edison-Beach type cars will be required. Clark, C. E. Cox. Engineer, A. J. Latornel.

Twps. Elzevir and Madoc, Ont.

Bay of Quinte Railway Co. has been authorized to construct spur for the Canadian Sulphur-Ore Co., Ltd., in Twps. of Elzevir & Madoc, Co. Hastings, Ont.

Fergus, Ont.

Seven concrete bridges and 1 abutment, planned for County of Wellington. Tenders close May 20th with D. Anderson, Fergus; C. G. Stickling, Winfield, and Bowman & Connor, engineers, 36 Toronto street, Toronto, Ont.

Greenock Twp., Ont.

Tenders received by Clerk, Thos. H. Purdy, Narva, Ont., until May 26th for steel bridge 40 ft. span, 14 ft. roadway, also for putting new abutments under a bridge on the base line.

Hanbury, B.C.

Canadian Pacific Railway Company has been authorized to construct spur for the Jewell Lumber Co., Ltd., Hanbury, at mileage 4.71 near Colvalli in sub-div. lot 13, lot 314 group 1, East Kootenay Dist. on its Fort Steele subdivision.

Hull, Que.

The Hull Electric Company has been authorized to construct spur from a point on its main line between Hull and Aylmer, Que., to the premises of Connaught Park Jockey Club of Ottawa in Twp. South Hull, Co. Wright, Que.

Hamilton, Ont.

Freight sheds and tracks (east end), planned by G. T. Rly. Co. will do its own work. 17 new tracks, each about 1 mile long.

G. T. Rly. Co. contemplate erecting a subway to be known as the "Y."

Reconstruction of part of high level bridge, cost $15,000, contemplated by city council. Mayor, John Allan. Engineer, A. F. Macallum. Concrete and steel work.

London, Ont.

C. P. R. Co. has been authorized to construct bridge No. 21.9 on London Sub. Div., Ont. Div. Ont.

Bridge, cost $25,000, Wharncliffe road. Mayor, C. M. R. Graham. Chairman Board of Works, B. W. Bennett. Engineers-in-charge, W. N. Ashplant & Company, Engineer Talbot. Tenders received were too high and new tenders will be called shortly.

Medicine Hat, Alta.

By-law will be voted on May 22, 1913, to determine whether the franchise for a street railway shall be awarded to the Montreal Engineering Company. If it is awarded the railway must be built and running in nine months.

Outremont, Que.

C. P. R. Co. has been authorized to construct spur for Seaman Kent Company, Limited.

Port Hope, Ont.

Bridges. G. T. Rly. Co.'s plans showing proposed structures to be constructed over Peter, Mill, Ontario and Barrett streets have been approved.

Prince Rupert, B.C.

Steel bridge, cost $35,000, over Morse River, planned by the municipality. City engineer, W. G. Mason. City clerk, Ernest A. Woods. By-law carried.

Rockwood, Ont.

Bridge for Twp. of Eramosa. Clerk, Wm. M. Head, Guelph. Engineers in charge, Bowman & Connor, 36 Toronto street, Toronto. Tenders received by Reeve, Chas. McNab. Plans and specifications at office of Reeve and Engineers. One span, 45 ft. long, concrete.

Rokeby, Sask.

Canadian Pacific Railway Company's proposed location of station at Rokeby on N.W. ¼ of Sec. 2-25-3 W. 2 M. has been approved.

Regina, Sask.

C. P. R. Co. has been authorized to construct spur to and into premises of the City Cold Storage Company, Limited, and The National Manufacturing Company.

St. Catharines, Ont.

Welland Canal, cost $50,000,000. Dominion Government, Dept. of Railways & Canals. Secretary, L. K. Jones, Ottawa. Chief Engineer, A. W. Bowden. Superintendent in charge, J. L. Weller, St. Catharines. It is intended to call for the work in sections, new end to be contracted for first. Tenders to be called for shortly.

St. John, N.B.

Pier. Tenders will be received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, up to May 20th. Plans, etc., at offices of F. G. Goodspeed, Dist. Engr., St. John, Geoffrey Stead, Dist. Engr., Chatham, N.B., J. G. Sing, Dist. Engr., Confed. Life Bldg., Toronto, J. L. Michaud, Dist. Engr., P.O. Montreal, C. E. W. Dodwell, Dist. Engr., Halifax, N.S., and at Dept., Ottawa.

C. P. R. Co. has been authorized to cross Portland street with spur to premises of J. W. McCready and Son, Ltd.

Sarnia Twp., Ont.

Two bridges, cost $4,000, known as "Byers" and "Andrews" bridges, each 34 ft. long, steel and concrete. Plans and specifications at residence of Reeve, A. Hillier, 8th Line, Sarnia Township. Consulting engineer, O. A. Coad, Alvinston, Ont. Tenders received by Reeve.

Province of Saskatchewan

C. P. Rly. Co. has been authorized to construct bridge No. 144.8 on Portal Sub Div., Sask.

Toronto, Ont.

C. P. R. Co. has been authorized to construct extension to Standard Sanitary Co.'s existing siding for Canada Foundry Company, Limited.

Twp. of Vaughan, Ont.

G. T. Rly. Co. has been authorized to construct siding and spur therefrom for the Maple Sand & Gravel Company, on Lot 23, Con. 3, Twp. Vaughan, Co. York, Ont.

Warner, Alta.

Canadian Pacific Railway Company's proposed change in location of station on N.E. ¼ Sec. 10-4-17 W. 4 M. at Warner has been approved.

Yates, Alta.

Grand Trunk Railway Company's location of station at Yates at mileage 917 West of Winnipeg in Sec. 32-53-16 W.5M. has been approved.

CONTRACTS AWARDED

Deseronto, Ont.

Dredging. Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, R. Weddell & Company, Trenton, Ont.

Greenwich, N.B.

"Jones Creek Bridge," cost $7,000. General contractor, Warden, W. R. Fawcett, Southampton, N.B. Prov. Govt. Dept. of Public Works. Minister, Hon. John Morrissy, Fredericton.

Ottawa, Ont.

Lumber, cost $130,000, for Hudson Bay Railway. Contractors, Atlantic Lumber Co., Kent Bldg., Toronto; Musgrove Lumber Company, Halifax, N.S.; Long Bell Lumber Co., Philadelphia, Pa. Owner, Dom. Govt. Dept. of Railways & Canals.

Public Buildings, Churches, Schools, etc.

Brant Twp. Ont.

School, cost $7,700, contemplated. 1-storey, white brick construction. Further information from M. A. McCallum, Malcolm, Ont.

Brussels, Ont.

Church, cost [illegible], for Presbyterian Congregation. Pastor, Rev. J. L. Mann. Stone and cement foundation, cut stone and concrete blocks construction. Plans in progress.

Calgary, Alta.

Smallpox hospital planned by the council. Clerk, J. M. Miller. By-law passed to raise $30,000 for building and site.

Edmonton, Alta.

School, Highlands Sub-div., 17 room, brick construction. Tenders received by Public School Board till May 15th. Plans, specifications, etc., at their office.

Essex, Ont.

Library, cost $10,000, contemplated by the town council. Clerk, Geo. Wightman.

Holland, Man.

School contemplated. Architect, A. Maxwell. Eight rooms, brick foundation and construction. Plans, specifications, etc., at office of Architect. Tenders received by Secretary-Treasurer, C. J. Crawley, till May 17th.

Montreal, Que.

Picture theatre, St. Lawrence Blvd., planned for Solomon Vineberg, St. Lawrence Blvd. Tenders will be received by Architects, Turner & Carless, 116 Board of Trade Building, until May 24th. Two storeys, 96 x 30, concrete foundation, brick front, felt and gravel roofing, heating.

Hospital, cost $16,000, Lachine (St. Louis) for Soeurs de la Providence, St. Catherine and Fullum streets, Montreal. Architects, Viau & Venne, 76 St. Gabriel street, Montreal. Three storeys, concrete foundation, hot water heating. Plans drawn.

Ottawa, Ont.

Hall, George, contemplated by the French-Canadian Institute, per Rodolph Girard, 536 Besserer street. Solid brick construction. Plans in progress.

Peniel, Ont.

Church near Cannington contemplated by Methodist Congregation. Architect, Wm. Taylor, Allandale, Ont., is preparing plans.

Port Dover, Ont.

Addition to high school, cost $30,000, planned by town council. Secretary, Jas. Sloan. Two storeys, white brick construction. By-law carried.

Prince Rupert, B.C.

School, cost $12,000, Borden street. City clerk, Ernest A. Woods. By-law has been passed.

Red Pheasant & Stony Reserves, Sask.

Tenders received by Secretary until May 26th, 1913, for farmers residence, stable, implement shed and storehouse. Plans, specifications, etc., at offices of Indian Agent, at Battleford, Sask., Agent of Dominion Lands Office, Prince Albert, and Indian Office, Winnipeg. Dom. Govt. Dept. of Indian Affairs. Secretary, J. D. McLean, Ottawa.

Sandwich, Ont.

Public School, cost $30,000. Architects, Van Leyen & Schilling, [illegible] Union Trust Bldg., Detroit, Mich. Brick, reinforced concrete and structural steel construction, brick and cement foundation. Plans in progress.

Scarboro, Ont.

School, cost [illegible]. Architects, [illegible] & [illegible], [illegible], Hamilton, have prepared plans which are being revised by the Board of Trustees.

Steelton, Ont.

Public school, cost $35,000 (Harris & [illegible] Subdivision), contemplated. Chairman School Board, W. A. Stone [illegible] By-law will be submitted to rate[illegible] [illegible]

Terrace, B.C.

[illegible] Dept. of Public Works [illegible]. Minister, Hon. Thos. Taylor, Victoria. Engineer, J. E. Griffiths, Victoria, will receive tenders till May [illegible]

Tillsonburg, Ont.

Church, cost $30,000, for Methodist Congregation. Pastor, Rev. J. H. McBain. Architect, W. E. N. Hunter, 306 [illegible] Building, Detroit, Mich. 96 x 90, steam heating, plumbing, slate and shingle roofing, seating, brick work being done by day labor. Tenders to be called for roofing, heating, plumbing, seating and interior fittings.

Toronto, Ont.

Theatre for R. B. Young, 1985 Queen E. Architects, Mallory & Thatcher, 31 Queen W. Two storeys, 25 x 130, structural steel and brick construction, stone and brick foundation. Tenders open.

Church, cost $25,000, for Kew Beach Presbyterians. Pastor, Rev. J. A. Stewart, 51 Hambly avenue. Tenders received by Lindsay & Brydon, 67 Victoria street. Stone and brick construction, cement foundation.

Addition to theatre, for R. Taglietti, Dundas and Dufferin. Tenders received by Architect, Neil G. Beggs, Room 12, Cosgrave Building. Two storeys, 35 x 100, brick construction and foundation.

Twps. of Woodhouse & Townsend, Ont.

School, cost $5,500, for School Sec. No. Secretary Woodhouse Twp., Frank Bowiby, Simcoe, Ont. By-law passed. Plans will be prepared.

CONTRACTS AWARDED

Berlin, Ont.

Municipal barns, cost $6,000, planned by city council (Board of Works). Mayor, W. R. Euler. Clerk, A. H. Miller. General contractor, Henry Braniff, 119 Young street.

Hamilton, Ont.

Theatre, cost $20,000, for E. J. Guest, c/o Empire Theatre, Barton street east. Architects, Stewart & Witton, 2 Hughson street south. Contracts not yet awarded. Reinforced concrete steel and brick construction, seating required.

Church, cost $17,500, Grosvenor Ave., for Kensington Ave. Methodists. Architect, F. W. Warren, Federal Life Building. General contractor, John Bryers, 11 Clinton street. One storey, pressed brick construction.

Montreal, Que.

Market, cost $100,000. Architect, Marius Dufresne, Lasalle and Ontario streets. Stone, J. Piche, 145 Bleury. Roofing, heating and plumbing, T. Lessard, 191 Craig. 2½-storeys, 100 x 100.

Convent, cost $72,500, Verdun (Gertrude), for Catholic School Commissioners. Architect and engineer, A. Benoit, 1198 Wellington street. General contractor, F. Sauve, 124 Church Ave. Four storeys, 89 x 55, concrete foundation, stone and structural steel construction, fireproof floors, felt and gravel roofing system. Addition to be added next year.

Toronto, Ont.

Pasturizing building, cost $6,000, College street, for Hospital for Sick Children. Architects, Stevens & Lee, 23 Scott street. General contractors, R Robertson & Sons, Confederation Life Bldg. Heating, Fiddes & Hogarth, 122 King E. Plumbing, Jno. Ritchie Co., 56 Adelaide E. Foundations in .

Winnipeg, Man.

Club house, Smith street, for The Knights of Columbus, 265 Portage ave. Architect, J. D. Atchison, Trust & Loan Bldg. General contractors, Fred Lewis & Co., Somerset Bldg. Four storeys, 76 x 120.

Business Buildings and Industrial Plants

Aylmer, Ont.

Remodelling office building, cost $3,000, for W. H. Finch. Plans in progress.

Canning, N.S.

Store, cost $3,000, for R. W. North. Site is being cleared and plans will be prepared.

Edmonton, Alta.

Rumely Products Company, Limited., will erect large machinery warehouse.

Glencoe, Ont.

Bank building, cost $7,000, for Merchants Bank. Manager, H. W. Britton. Two storeys, white and pressed brick construction, stone and cement foundation. Plans drawn.

Hamilton, Ont.

Two stores and apartments, cost $10,000, James street north, for R. Phillips, 481 King street east. Tenders received by Architect, Jas. Balfour, 36 James St. south.

Two stores, cost $7,000, Barton street east, planned for R. W. Farrar, Market Square. Contracts not yet awarded. Permit granted.

The Dom. Natural Gas Company, Bank of Hamilton Building, Hamilton. Will install gas services for New Bros. new brick yards on the Hamilton road, 1,500 feet pipes and mains.

Lindsay, Ont.

Addition to auto factory, Wellington street, for The Fitzsimmons Automobile Body Works Co. Manager, J. A. Fitzsimmons. Cement block construction. Plans in progress.

Hood & Son contemplate erecting new knitting factory on old site. Cement block construction.

Montreal, Que.

Factory, cost $6,000, St. Lambert (6th avenue), for L. Bourbonnais & Perron, Limited. Two storeys, 125 x 75, concrete foundation, brick construction, felt and gravel roofing. Plans drawn.

Ottawa, Ont.

Stores, alterations and additions, cost $30,000, for L. N. Poulin, Limited, 156-8 Sparks street. Four storey addition. Plans in progress.

Business block, cost $100,000, Bank, for F. W. Carling, Metropolitan Bldg. Tenders received by Architect, C. P. Meredith, 126 Sparks. Provision will be made to carry building to 10 storeys. Seven storeys, cement foundation, stone, reinforced concrete construction.

Printing plant, cost $40,000, Nepean, for Lowe-Martin Printing Co., Albert St. Architects, Keefer, Richards & Abra, 229 Sparks St. Five storeys, cement foundation, reinforced concrete construction. Plans in progress.

Port Dover, Ont.

Cannery, cost $15,000, contemplated by Carpenter Bros., Winona, Ont.

Richmond Hill, Ont.

Greenhouses, etc., contemplated by J. H. Dunlop, 644 Lansdowne Ave., Toronto. Town council has promised fixed assessments for 10 years.

St. John, N.B.

Foundry, Marsh Rd., contemplated for McAvity & Sons. Messrs. Lockwood & Green, Boston, Mass., have been engaged to make preliminary plans for plant.

Toronto, Ont.

Store, for J. H. Morrow, 230 Christie street. Architect, P. H. Finney, 79 Adelaide east. Two storeys, brick construction and foundation. Plans in progress.

Factory, cost $15,000, George street, for Mr. Franiton, c/o Architect, C. J. Read, 404 Confed. Life Bldg. Two storeys, 41 x 125, brick foundation, structural steel and brick construction. Plans drawn.

Garage, cost $3,500, for H. Gaffney, 1450 Dundas. Architect, T. A. Fleming, 94 Laws street. One storey, 50 x 171, cement foundation, structural steel and brick construction. Plans drawn.

Two stores, Rainsford and Queen, for L. Lumbers, c/o Architect, P. H. Finney, 79 Adelaide east. Work will be done by day labor. Three storeys, brick construction, brick foundation, felt and gravel roofing. Plans in progress.

Five stores, for C. A. Scott, 575 Logan Ave. Architect, P. H. Finney, 79 Adelaide east. Owner will buy material, work day labor. Two storeys, brick construction, brick foundation, felt and gravel roofing, store fronts and fixtures. Plans in progress.

Two stores, Brookmount, for D. B. Bowerman, 3 Lamport avenue. Architect, P. H. Finney, 79 Adelaide east. Brick construction, brick foundation. Plans in progress.

One pair stores and residences, cost $7,000, Bloor, for L. Lefron, 92 Harbord. Architect, E. Churchill, 22 Juniper Ave. Three storeys, 45 x 50, structural steel and brick construction, stone foundation, felt and gravel roofing, store fronts and fixtures. Plans drawn.

Store and residence, cost $3,000, Miller and Davenport, for J. F. Wainwright, Miller and Davenport. Architect, W. Cross, 262 Garden Ave. Two storeys, 22 x 42, brick construction, stone foundation. Plans drawn.

Offices, cost $10,000, Toronto street, for Consumers Gas Co., 19 Toronto St. Architects, Burke, Horwood & White, 28 Toronto St. Two stys., 48 x 115, structural steel and brick construction, brick foundation, felt and gravel roofing. Plans drawn.

Factory addition, cost $8,000, Cherry street, for British American Oil Company, 707 Lumsden Bldg. One storey, 30 x 60, structural steel and reinforced concrete construction, cement foundation, felt and gravel roofing. Plans drawn.

Bank and residence, cost $12,000, St. Clair, for Dominion Realty Co., 34 King street west. Two storeys, 42 x 43, brick and stone construction, brick foundation. Plans drawn.

Windsor, Ont.

Alterations to hotel, cost $7,000, for J. E. Peters. Tenders received by Architect, Clare Williamston until May 30th.

One storey addition, brick construction, maple floors.

Waterdown, Ont.

Warehouse, cost $4,000, for Wentworth Orchard Co., head office, Dundas. President, A. C. Caldwell, Dundas. Sec. Treas., H. C. Clark, Dundas. Managing director, Geo. Nicholson, Waterdown Two storeys, artificial stone construction, stone foundation. Plans in progress.

Winnipeg, Man.

Dry kiln, cost $5,000, Pt. Douglas, for Sprague Lumber Co., 47 Higgins Ave. Two storeys, 22 x 62, brick, brick foundation. Permit issued.

200 room addition to hotel, Broadway, for G. T. P. Rly. Architects, Ross & McDonald, Union Bank Building, are preparing plans.

CONTRACTS AWARDED

Edmonton, Alta.

Business block, cost $50,000, for M. Runnalls, 140 Jasper avenue west and Dr. Nicholls, 152 Jasper avenue east. Architect, C. E. Hopkins, Jasper avenue. General contractors, Reed, MacDonald & Brewster. Two storeys, to be erected now, 4 storeys to be added later, 53 x 100, concrete foundation, structural steel, sandstone and brick construction, concrete. Excavation done.

Business block, cost $10,000, Namayo, for Mr. Love, 17th street and Mr. Raymond. Architect and general contractor, J. Yuill, 119 4th street. Two stys., 23 x 70, brick foundation and construction. Excavating started.

Hamilton, Ont.

Addition to bond warehouse, cost $6,000, Oxford street, for Geo. E. Tuckett & Sons, Queen north. Architects, Stewart & Witton, H. P. & L. Bldg. General contractors, Mitchell & Riddell, 91 Peter street. One storey addition, 76 x 190, brick construction.

Stores and apartments, cost $7,000, Barton street east, for Chas. Lemon, 156 Markland street. Architect, E. B. Patterson, 167½ King street north. General contractor, W. H. Leedham, 81 George street. Two storeys, 37 x 35, pressed brick construction. Foundations in.

Addition to factory, cost $1 000, for Regal Shirt Company, Bay and King Sts. General contractor, Geo. T. Mills, 614 King street east. Reinforced concrete construction, brick and fireproof doors.

Ottawa, Ont.

Garage, cost $8,000, for Ottawa Electric Railway. Supt. Mr. Burpee, Albert St. Architect, J. Albert Ewart, 193 Sparks street. General contractor, Alex. Garvock, 136 Lewis. Solid brick construction, cement foundation, patent roofing.

Petrolia, Ont.

Warehouse, cost $10,000. Owner and builder, Wm. Kettle, Wingfield street. Two storeys, 40 x 100, cement block construction, cement foundation. Excavating started.

Port Dalhousie, Ont.

Factory, cost $30,000, for Pt. Dalhousie Canning Company. Architects, Watt & Blackwell, Lister Bldg., Hamilton. General contractors, Newman Bros., 75 St. Paul street, St. Catharines. Three stys. concrete construction.

Regina, Sask.

Hotel, cost $1,000,000, for G. T. P. Rly Co. Architects, Ross & Macdonald, Belmont street, Montreal. General contractors, Lyall Mitchel Co., Union Depot, Winnipeg. Nine storeys, 160 x 160.

St. John, N.B.

Bank building, for Bank of British North America. Architect, G. E. Fairweather, Germain street. General contractors, B. Mooney & Sons, 112 Queen street. Carpenter, E. Green, 24 Seely street. Painting, Jas. Pullen, Horsefield street. Plumbing, J. H. Doody, Canterbury street. Sheet metal, Jas. McDade, Mill street.

Office building, for Armstrong & Bruce, Prince William street. Architect, H. C. Mott, 13 Germain street. General contractors, British & American Construction Co. Manager, P. I. Ligon, Victoria Hotel.

South Edmonton, Alta.

Stores and offices, cost $15,000, 5th street east, for C. Gallagher, 11th street and McKay avenue. Architect and general contractor, J. Yuill, 1119 4th street. Three storeys, 45 x 48, concrete foundation, brick construction. Foundations in.

Toronto, Ont.

Stores and residences, cost $8,000, for E. J. Linington, 238 Dundas street. Architects, Chadwick & Beckett, 18 Toronto street. Mason, Albert Webb, 13 Shirley street. Carpentry, Hill & Strathy, 123 Simcoe street. Iron and steel, J. T. Hepburn, 18 Van Horne. Plumbing, G. F. Mason, 467 College. Three storeys, 24 x 50, structural steel and brick construction, brick foundation.

Factory, cost $4,500, Owners and Builders, Batts Limited, Pacific avenue. Two storeys, 18 x 40, brick construction and foundation, felt and gravel roofing.

Two stores and residences, cost $12,600, Queen street east, for W. Taylor, 1349 Queen east. Architect, J. G. Hedges, 210 Clinton. General contractor, J. E. Wainwright, 621 Crawford. Two storeys, 48 x 52, structural steel and brick construction, brick foundation.

Winnipeg, Man.

Warehouse, cost $45,800, for P. R. Walters, care architect, J. H. G. Russell, McArthur Block. General contractors, Atlas Construction Co., care architect. Three storeys, 50 x 100, brick, cement foundation, felt and gravel roofing.

Repairs to warehouse, cost $5,000, for Stobarts Sons & Company, McDermot and King streets. Architect, J. H. G. Russell, 1111 McArthur Building. General contractor, A. J. Bonnett, Confed. Life Building. Repairs consist of new floors, windows, roof.

Residences

East London, Ont.

Parsonage, cost $5,000, contemplated by Hyatt Ave. Methodist Congregation. Pastor, Rev. J. E. Millyard. Two stys., stone and cement foundation, pressed brick construction. Plans will be prepared.

Grimsby, Ont.

Grimsby Beach, Ltd., H. H. Wylie, Room 5, 167 Yonge street Toronto, will receive tenders on 30 cottages. Material and workmen required for building roller coaster, extension of pier, etc. Large addition will be made to hotel in the fall. Full information from A. E. Hoe or Geo. Fair, Grimsby Beach.

Hamilton, Ont.

Residence, cost $8,000, Westmoreland, for Chas. H. Hartmann, 69-61 MacNab street north. Tenders received by Architects, Mills & Hutton, Bank of Hamilton Building. 2½-storeys, 47 x 25, stone foundation, pressed brick construction.

Residence, cost $5,000, for E. K. Pass, 91 John street south. Tenders received by Architect, W. A. Edwards, 7 Hughson street south. 2½-storeys, 26 x 32, stone foundation, pressed brick construction.

Residence, cost $4,000, Beulah avenue, planned for F. J. Howell, c/o Howell Lithographing Co., Vine street. Contract not yet awarded. Pressed brick construction, stone foundation.

Residence, cost $9,000, Mountain Top, for A. V. Young, 301 James street south. Architect, Stewart McPhie, Bank of Hamilton Building, has prepared plans.

Montreal, Que.

Flats, cost $30,000, Verdun, First ave., for J. H. Leclair, 276 Eglise. Three storeys, 150 x 40, concrete foundation, brick construction, felt and gravel roofing. Plans drawn.

Residence, cost $8,000, for J. B. Rodier, 199 Cote St. Catherine Rd., Outremont. Architect, J. A. Ouellet, 250 Amherst street, Tenders received by architect to May 17th. Two storeys, 30 x 40, concrete footings, stone and brick construction.

Two cottages, cost $12,000, two stys., Nelson and Villeneuve, Outremont, for L. Lanctot, 1333 St. Hubert St., Mont. Tenders received by architect, J. A. Ouellet, 250 Amherst street, Montreal, until May 17th.

Alterations to residence, cost $5,000, for O. R. Tourgis, 444 Durocher. One storey, 25 x 25. Plans drawn.

Residence, Outremont (Maplewood Ave.), for E. Fabre Surveyer, 615 Dom. Express Bldg. Tenders will be received by Architects, Turner & Carless, 116 Board of Trade, from May 19th to June 2nd. Two storeys, 48 x 50.

Residence, cost $18,000, Outremont (Bloomfield) for P. E. Rouillier, 2108 Waverly street. Three storeys, 24 x 78, stone foundation, pressed brick construction. Plans drawn.

Residence, cost $8,000, Verdun (Lasalle), for Louis Deschoneaux, 38 Lasalle Ave. Three storeys, 50 x 42, concrete foundation, brick encased construction, felt and gravel roofing. Plans drawn.

Residence, cost $10,000, Lachine (Notre Dame and 34th avenue), for Jas. A. Smart, Lachine Locks. Work done by day labor. 2½ storeys, 36 x 49, stone foundation, pressed brick construction. Plans drawn.

Residence, cost $3,800, Verdun (Gordon), for L. Lavigne, 140 Gordon. Three storeys, 26 x 40, concrete foundation, brick construction, felt and gravel roofing. Plans drawn.

Two cottages, cost $6,000 each, Outremont (Nelson and Villeneuve) for J. Lanclot, 1333 St. Hubert street, Montreal. Architect, J. A. Ouellet, 250 Amherst street, Montreal. Two storeys, concrete foundation, pressed brick construction, felt and gravel roofing. Plans done.

[illegible]

[illegible]. Three storeys, 24 x 64, stone foundation, [illegible] brick construction, felt and gravel roofing. Plans drawn.

Niagara Falls, Ont.

[illegible] \$4,500, contemplated for [illegible], Huron street. Architect not yet chosen. Two storeys, 35 x 45, pressed brick construction, stone foundation.

Ottawa, Ont.

Residence, cost \$6,000, for F. Billon, Primrose Avenue. Stone foundation, brick construction. Plans in progress.

Residence, cost \$8,000, Mutchmore, for H. Putnam, 146 4th avenue. 40 x 26, stone foundation, brick veneer construction. Plans drawn.

Residence, cost \$5,500, Powell, for Geo. Grant, 28 4th avenue. 34 x 31, brick veneer construction, stone foundation. Plans in progress.

Residence, cost \$3,600, Sunnyside, for J. A. McAllister, 253 Sunnyside. Stone foundation, brick veneer construction. Plans in progress.

Residence, cost \$5,500, for F. E. White, 137 Stewart street. Architect, W. E. Noffke, Central Chambers. 24 x 40, brick veneer construction, stone foundation. Plans drawn.

Residence, cost \$3,800, Clarence, for Peter Beaupre, 185 Cambridge. 23 x 34, stone foundation, brick veneer construction. Plans in progress.

St. Anne de Bellevue, Que.

Residence, for J. Kruse. Tenders close with Architects, Turner and Carless, 116 Board of Trade Bldg., Montreal, May 20th. 2½-storeys, 30 x 45, concrete foundation, rubble stone walls.

Residence, cost \$12,000, for Royal Institute of Learning. Tenders received by Architects, Hutchison, Wood & Miller, 50 Royal Ins. Bldg., Montreal. 2½-stys., 30 x 30, cement foundation, tiles required for cess pit.

Sault Ste. Marie, Ont.

Five residences, cost \$20,000, Pim and Wellington, for W. J. Hesson, Bay street. Architects, Moran & McPhail, Queen St. Three storeys and basement, 120 x 32, stone foundation, brick veneer construction. Tenders close with Architect, May 20th.

Stratford, Ont.

Residence, cost \$3,000, Caledonia, for Geo. H. Langan, Downie street. Architect, J. S. Russell, Downie street. Two storeys, basement and attic, red pressed brick construction, stone foundation. Plans in progress.

Sherbrooke, Que.

Apartments and residences, cost \$10,000, King street, planned for Joseph Houle, Grand Union Hotel. Tenders received by owner from May 15 to 20th. Three storeys, 35 x 60, brick construction, cement foundation.

Toronto, Ont.

One detached residence, cost \$4,000, for Thos. Craise, 20 Hendricks. Architect, Thos. Browning, 20 Hendricks. 2½-storeys, 23 x 36, brick construction and foundation. Plans drawn.

One pair residences, cost \$6,000, Alberta, for W. J. Cole, 541 Euclid. Architect, J. G. Hedges, 210 Clinton. 3½-stys., 45 x 30, brick construction, stone foundation. Plans drawn.

Residence, cost \$5,000, Hutchison ave., for R. J. Scott, 15 Bowden ave. Architects, Designing & Draughting, 36 Toronto street, have prepared plans. Owner will ask for tenders. 2½ storeys, brick construction and foundation.

One detached residence, cost \$4,000, Bedford, for A. Wiles, Bedford and Davenport road. Architect, T. Lewis, 329 Davenport. Two storeys, 32 x 36, brick construction and foundation. Plans drawn.

One detached residence, cost \$5,000, Oakmount, for A. M. King, 15 Grove avenue. Two storeys, 30 x 52, brick construction, stone foundation. Plans drawn.

One pair residences, cost \$6,200, Gladstone, for A. Nelson, 346 Palmerston Blvd. Architect, J. Hunt Stanford, Bloor and Ossington. 2½-storeys, 36 x 42, brick construction, stone foundation. Plans drawn.

Apartment, cost \$6,500, Winchester, for J. W. Walker, 501 Palmerston Avenue. Architect, J. Hunt Stanford, Bloor and Ossington. Two storeys, 18 x 68, brick construction, stone foundation. Plans drawn.

One detached residence, cost \$7,500, for Thos. Stanbury, 1 Dunbar Road. Architect, J. H. Stanford, Bloor and Ossington. 2½-storeys, 24 x 36, brick constructioin, brick foundation. Plans drawn.

Three attached residences, cost \$9,000, Gladstone, for A. Nelson, 346 Palmerston Blvd. Architect, J. Hunt Stanford, Bloor and Ossington. 2½-storeys, 48 x 42, brick construction, stone foundation. Plans drawn.

Westboro, Ont.

Residence, cost \$4,000, Riverside Park, for Wm. Healey, 10 Dalhousie street, Ottawa. Stone foundation, brick construction. Plans in progress.

Winnipeg, Man.

Residence, cost \$8,000, Oakdale Park, for J. W. Campbell, Westminster and Lipton streets. Architect, E. G. Sherwood, Commonwealth Block. 2½-stys., and basement, stone foundation, brick veneer construction. Tenders being received by Architect.

Winnipeg Beach, Man.

Summer cottage, cost \$4,000, planned for Y. W. C. A., Ellice avenue, Winnipeg. Architect, J. H. G. Russell, 1111 McArthur Building, Winnipeg. Frame, stone foundation. Tenders have been received.

Windsor, Ont.

Residence, cost \$6,000, Ouellette, for A. B. Lewis. Tenders received by architect, Clare Williamston, until May 16. Masonry, day labor. Two storeys, 28 x 42, brick construction and foundation.

CONTRACTS AWARDED

Ancaster, Ont.

Residence, cost \$6,000, for Chas. Irish. Architect, E. B. Patterson, 167½ King east, Hamilton. Mason, Simpson & Hendry. Carpentry and roofing, Eli Smith. Two storeys, 30 x 32, red brick construction, stone foundation. Excavating started.

Residence, cost \$4,600, for Fred. Reinkie. Architect and general contractor, Brian Carpenter, Glanford. Two storeys, 32 x 38, Buff pressed brick construction, stone foundation. Excavating started.

Granby, Que.

Dwelling, cost \$6,000, Elgin street, for Wm. Strum, 256 Granby. Builder and general contractors, The Kent Lumber Co., Granby. Painting, M. J. Johnson Son & Co. Heating, W. M. Topp & Co. 2½ storeys, 38 x 31 and L 25 x 22, cement and brick construction. Foundations in.

Hamilton, Ont.

Residence, cost \$10,000, Aberdeen Ave., for C. E. Goering, 173 Marland street. Architects, Watt & Blackwell, Lister Building. General contractor, H. C. Gummo, 15 Tuckett street. 2½-storeys, brick construction. Excavating started.

Residences, cost \$18,000. Architects and owners, Stewart & Witton, 2 Hughson street south. General contractor, L. Mattice, 106 Birch avenue. Brick construction, stone foundation, mantels. Permit granted.

Residence, cost \$5,000, for D. Shapiro, 75 Victoria Ave. S. Architect, J. D. Corrigan, 231 Catharine St. N. General contractor, R. Somerville, 108 Sanford Avenue.

Residence, cost \$4,500, for F. M. McBeth, 76 West Ave. S. Mason, H. Jones, 127 Macauley street. Carpenter, T. M. Hurst, 106 Catharine St. S. Brick construction, stone foundation.

Ten residences, cost \$30,000. Owner and general contractors. Bennett & Thwaites, Main & Hughson streets. Brick construction, stone foundation.

Residence, cost \$6,000, Main street E. Architect and general contractor, F. A. Havers, 50 Dunsmore Ave. Stone foundation, pressed brick construction. Permit granted.

Montreal, Que.

Flats, cost \$14,500. Owner and builder, M. T. Proulx, 109-B Galt street, Verdun. Three storeys, 95 x 43, brick, concrete foundation.

One pair semi-detached residences, cost \$24,000, Westmount, Lansdowne, for Isaac Collins, 207 Ash ave. Indiana limestone, concrete and brick, S. Whitaker, 285 Addington, Notre Dame de Grace. Owner will do rest of work. Two storeys and basement, 25 x 51, concrete foundation, Laparirie brick construction, plastic relief.

Residence, cost \$15,000, Ainslie, Outremont, for A. G. Lavallee, 101 St. Lawrence Blvd. Architect, Chas. Bernier, 70 St. James street. General contractor, P. Brouillet, 79½ Elizabeth, Montreal. 2-storeys, 38 x 58, concrete foundation, brick and stone construction. Foundations in.

Nine flats, cost \$11,000. Owner and builder, R. Brunette, 2245 St. Hubert. Three storeys, 50 x 50, felt and gravel roofing. Foundations in.

Residence, cost \$5,000, for F. Ostrom, 14 Hickson, Verdun. Builder, L. W. Julien, 270 Ethel. Three storeys, 25 x 50, concrete foundation, brick construction, felt and gravel roofing.

Residence, cost \$8,000. Owner and builder, Thomas Grenier, 230 Galt. 3-storeys, 50 x 40, concrete foundation, brick construction, felt and gravel rfg.

Residence, cost \$5,000. Owner and builder, Paul Lalonde, 459 Lasalle ave., Verdun. Three storeys, 25 x 60, concrete foundation, brick construction, felt and gravel roofing.

Residence, cost \$5,000, for Wm. Hughes, 311 Charlevoix St. Builder, J. B. Colleth, 202 Chateauguay. Three storeys, 25 x 40, concrete foundation, brick construction, felt and gravel roofing.

Residence, cost $3,000, Owner and builder, Louis Mongean, 570 Church ave. Verdun. Three storeys, 25 x 40, concrete foundation, brick construction, relt and gravel roofing.

Residence, cost $7,500, for J. B. Lalonde, Church & Joseph. Builder, S. Lalonde, 14 B Gordon. Three storeys, 40 x 40, concrete foundation, brick veneer construction, felt and gravel roofing.

Residence, cost $6,000, Outremont, Bloomfield, for Ernest Trudeau, 117 St. Joseph Blvd. Builder, Louis Brosseau, care owner. Three storeys, 90 x 29, concrete foundation, brick construction.

Ottawa, Ont.

Residence, cost $12,000, Marlboro, for Lt.-Col. F. Gourdeau, 27 Goulburn. Architect, C. P. Meredith, 126 Sparks St. Masonry, Holbrook & Sutherland. Carpentry, Richards & Co. Other contracts not let yet. Stone foundation, solid brick construction.

Residence, cost $4,000, Fentiman ave. for John Tully, Cooper street. General contractor, B. A. Greson, 100 Fentiman. 2½ storeys, 26 x 30, cement foundation, concrete block and artificial stone construction.

Residence, cost $8,000, for C. S. Smith, 289 Clemow. Architects, Keefer, Richards & Abra, 229 Sparks street. General contractors, Smith Bros., 448 McLeod. 2½ storeys, 35 x 38, brick veneer construction, stone foundation.

Peterboro, Ont.

Residence, cost $4,800, Homewood ave., for F. W. Trebilcock, 417 George St. Builder, X. F. Ephgrave, 615 Union St. 2½ storeys, 30 x 36 ft. 3 in., brick, stone foundation, shingle and asbestos roofing.

Sackville, N.B.

Residence, cost $6,000, Bridge street, for Mrs. Capt. Calhoun. Architect, Mr. Allen, Amherst, N.S. Masonry, Carpentry, roofing and painting, J. A. Hicks. Plumbing, W. Houlton. Wood construction.

Toronto, Ont.

One detached residence, cost $6,500, Rosehill ave., for D. H. Atkinson, 121 Tyndall. Architect, J. H. Galloway, 23 Toronto street. Two storeys, 24 x 48, brick construction, stone foundation. Plans drawn.

One detached residence, cost $8,000, Dowling, Owner and builder, A. F. Jury, 39 Sunnyside. Two storeys, 36 x 54, brick construction and foundation.

Apartment, cost $6,500, Winchester, for J. W. Walker, 501 Palmerston ave. Architect, J. Hunt Stanford, Bloor & Ossington. Owner buys material, work by day labor. Two storeys, 18 x 68, brick construction, stone foundation.

Two pair residences, cost $11,000, Browning. Owners and builders, A. & A. Grant, 837 Logan ave. 2½ storeys, 26 x 40, stone foundation, brick construction.

One detached residence, cost $6,000, Glengrove, for L. J. Musson, Cayuga, Ont. Builder, G. B. Hoole, 6 Mailbon ave. 2½ storeys, 23 x 36, brick construction, stone foundation.

Apartments, cost $70,000, Howard, for J. M. Chalmers, 644 Ontario street. Architect, J. Hunt Stanford, Bloor and Ossington. General contractors, Chalmers Bros., 644 Ontario street. Three stys., 50 x 105, structural steel and brick construction, stone foundation. Foundations started.

Residence, cost $7,500, Alexandra Blvd. for Herb. Begg, 121 Admiral Rd. Architect and builder, E. E. Woodley, 158 Davenport Rd. Two storeys, 26 x 36, brick construction and foundation.

Apartments, cost $70,000, for J. M. Chalmers, 644 Ontario. Architect, J. Hunt Stanford, Bloor & Ossington. General contractors, Chalmers Bros., 644 Ontario street. Heating, plumbing and electrical, not yet awarded.

Winnipeg, Man.

Residence, cost $4,500, Basswood Pl. Architect and builder, A. G. Davidson, 509 McIntyre Block. Two storeys, 27 x 28, frame, stone foundation, maple floors. Excavating started.

Two residences, cost $6,000, Noble. Architects and builders, Vogel & Lifschitz, 610 McIntyre Block. Two stys., 20 x 26, frame, stone foundation. Excavating started.

Residence, cost $5,000, Ashland. Owner and builder, J. P. Palmatier, 1008 Dorchester street. 2½ storeys, 28 x 28, frame, stone foundation. Excavating done.

Power Plants, Electricity and Telephones

Caledonia, Ont.

Grand Trunk Railway Company contemplate installing hydro-electric light in their station, sheds and yards.

Calgary, Alta.

Power machinery. Bowness Investment Co. of Calgary will receive tenders up to May 31st, 5 p.m., for the following machinery and equipment: "A" 2 alternating current generators. "B" 2 direct connected exciters; one motor-driven exciter set. "C" 1 six panel switchboard. "D" 1 series tungsten lighting system. "E" transmission lines and underground cable. "F" 2 vertical multi-cylinder internal combustion engines. Specifications from engineer.

Hagersville, Ont.

Hydro-electric Commision of Ontario, Bay and Richmond streets, Toronto, contemplate a hydro transformer station at Hagersville. If station is erected 3-600 h.p. transformers will be required.

Port Dover, Ont.

Hydro-electric system contemplated by the Town Council (Reeve Vyse). By-law for installation of a complete new system will be voted on shortly.

Prince Rupert, B.C.

Telephone system, cost $10,000, planned by City Council. Clerk, Ernest A. Woods. Engineer, W. G. Mason. By-law carried.

Stratford, Ont.

Underground conduit system contemplated by Bell Telephone Co. Manager, S. Gibson. Plans will be prepared at once.

West Flamboro Twp., Ont.

Dundas Hydro-Electric System plan extension of system to villages of Greensville and Bullocks Corners. Plans include power for Dundas waterworks system at Greensville, about one-half mile west of village. Estimated cost $4,000. Chairman, R. W. Karch, Dundas.

Wallaceburg, Ont.

J. M. Hess is seeking site on which to erect factory for manufacture of explosive powders to be used in connection with mining.

Business Notes

Winnipeg, Man.

Oil warehouse, of the Continental Oil Co., Morgan ave., burned. Bldg. completely destroyed. Loss $30,000, covered by insurance.

New Companies

The Toronto Clay Products Limited have been incorporated with a capital of $300,000, to erect buildings and deal in land and building material, with head office at Toronto. The provisional directors are C. J. Quarrington, J. B. Ferguson, managers, and G. F. DeWitt, salesman, all of Toronto.

Rideau Silicate Company, Limited, has been incorporated, with a capital of $400,000, to carry on business as manufacturers of brick, artificial stone, terra cotta, tiles, etc., and carry on business as contractors and engineers, with head office at Ottawa. The provisional directors are Edward McMahon, Insurance agent, J. W. A. Kirk, contractor, and J. J. MacCraken, solicitor, all of Ottawa.

The Consolidated Building & Supply Co., Ltd., has been incorporated with a capital of $250,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are R. E. McCuaig, T. F. McFarlane and H. D. Roade, salesmen, all of Toronto.

Superior Bitulithic Limited, incorporated with a capital of $150,000, to carry on in all its branches the business of paving and general contracting, with head office at Port Arthur. The provisional directors are W. G. MacKendrick, W. H. Legge, contractors, and J. W. Archibald, secretary, all of Toronto.

Kensington Estates Limited, has been incorporated with a capital of $40,000, to carry on a general land and building business with head office at Toronto. The provisional directors are C. J. Mickle, barrister, J. McNeel, bank manager, and F. E. Caldwell, accountant, all of Toronto.

The Barrie Land Company, Limited, has been incorporated with a capital of $40,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are Peter L. Fraser, manager, F. R. James and F. S. Manning, agents, all of Toronto.

Canadian Concrete Products Company, Limited, has been incorporated with a capital of $50,000, to manufacture and deal in limestone, marble, stone and cements of all kinds, with head office at Toronto. The provisional directors are G. H. Sedgewick, A. G. Ross, and A. E. Langham, barristers, all of Toronto.

W. H. Hubbard & Company, Limited, have been incorporated with a capital of $40,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are John Bulger, carpenter, W. H. Hubbard, contractor, and W. W. Naylor, salesman, all of Toronto.

Tenders and For Sale Department

CITY OF PORT ARTHUR

Tenders for Waterworks Department

Sealed separate tenders for each section will be received by the undersigned up to 5 o'clock p.m. of **Monday, May 19th, 1913**, for the construction of sections 1 to 10 inclusive of the new Force Main.

The work includes the trenching necessary, the laying of steel piping, valves, specials, etc., and constructing valve chambers.

Approximate quantities:

Trenching and laying 12-in. steel pipe, 6,000 ft.
Trenching and laying 24-in. steel pipe, 40,000 ft. in single and double trench.

Trenching and laying 2,500 ft. duplicate 24-inch intake in Lake Superior.

Material supplied by the Corporation.

Plans and specifications can be seen at the office of T. Aird Murray, 303 Lumsden Building, Toronto, or at office of L. M. Jones, City Engineer, Port Arthur, Ont.

A marked cheque for five per cent. of the cost of the work must accompany each tender.

The lowest or any tender not necessarily accepted.

J. J. HACKNEY.
Corporation Offices, Port Arthur,
April 21st, 1913. 20

Tenders for Power Plant Equipment

Sealed tenders, registered and endorsed on the envelope, Tender for (tender bidden on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the town of the Pas, will be received up to 6 p.m., **May 20th, 1913**, for the supply and delivery of the following machinery and materials:—

Tender "A"—For the supply, delivery and erection of two crude oil engines.

Tender "B"—For the supply, delivery and erection of two generators, exciters, switch, and other apparatus.

Tender "C"—For the supply and delivery of, approximately,

4400 ft. of 12-in. steel pipe or cast iron pipe.
3500 ft. of 10-in. steel pipe or cast iron pipe.
4400 ft. of 8-in. steel pipe or cast iron pipe.
2000 ft. of 6-in. steel pipe or cast iron pipe.
50 specials.

Tender "D"—For the supply and delivery of 30 hydrants, 52 gate valves, and boxes.

Tender "E"—For the supply and delivery of two pneumatic storage tanks.

Marked cheque for five per cent. (5 p.c.) of the amount of the tender must accompany each bid. The lowest or any tender not necessarily accepted.

For the supplying of materials, the tender forms must be filled in, copies of which are attached to the specifications, or are obtainable at the Consulting Engineer's offices.

Plans and specifications may be seen at the offices of the Consulting Engineers, Saskatoon, Sask., "The Canadian Engineer," Toronto, Winnipeg and Montreal, or a complete set of plans and specifications for any contract will be given, or forwarded, on a deposit of Twenty-five ($25) Dollars, and a set covering all the contracts on a deposit of One Hundred ($100) Dollars. If the prospective bidder sends in a bid on the tenders asked for, the deposit will be returned when the plans and specifications are returned.

H. H. ELLIOTT, M.D.,
Secretary-Treasurer,
The Pas.

Murphy & Underwood,
Consulting Engineers,
Saskatoon, Sask. 18-20

Tenders Wanted

Sealed tenders, separate or in bulk, will be received by the undersigned, until 6 p.m. on **Friday, the 16th inst.**, for the masonry, carpentry, structural steel and roofing required in the erection of St. Clare's Church, corner of St. Clair and Ravensden aves., Toronto. Plans and specifications at the office of the architect. The successful contractor will be required to give bonds for the satisfactory carrying out of the work. The lowest or any tender not necessarily accepted. Arthur W. Holmes, Architect, 10 Bloor Street East, Toronto. 20

Tenders Street Machinery

TOWN OF WELLAND

Tenders will be received by the undersigned until **Tuesday, May 20th**, at noon, for the following material:—

One 600 Imperial Gallon Street Sprinkler.

One Rock Crusher, having capacity of 10 to 15 tons per hour, Elevator, Rotary screen and 15-ton Portable Bin.

Competing firms to send descriptive matter, state number of days required after acceptance **to make delivery. Price to include all freight** and duty charges to Welland.

The lowest or any tender not necessarily accepted.

D. T. Black, Town Engineer.
May 7th, 1913. 20

Sealed tenders addressed to the undersigned, and endorsed "Tender for Men's Block, New Barracks, Toronto, Ont.," will be received until 4 p.m. on **Tuesday, June 24, 1913**, for the construction of a Men's Block, New Barracks, Long Branch, near Toronto, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the office of Mr. Thos. Hastings, Esq., Clerk of Works, Postal Station "F," Yonge Street, Toronto, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—39115. 20-21

TOWN OF DUNNVILLE, ONT.

Board of Waterworks Commissioners

Sealed tenders addressed to B. L. Edgecombe, Chairman of the Water Commission, will be received up to 9 p.m., on the **31st of May, 1913**, for the laying of approximately 10,000 feet of water mains, all materials to be supplied by the Water Commission.

Specifications and instructions to bidders to be had on application to the undersigned.

ROBERT G. KYD,
19-20 Superintendent.

CITY OF PORT ARTHUR

PROVINCE OF ONTARIO

Tenders for Pumps, Etc.

Tenders will be received by undersigned up to **May 26th**, for three motor driven centrifugal pumps of two thousand gallon per minute capacity together with pumping valves, meters, switchboard, and all necessary apparatus for operating same.

Specification and tender form can be seen at office of L. M. Jones, City Engineer, Port Arthur, Ont., or T. Aird Murray, Consulting Engineer, Lumsden Building, Toronto, or at the Winnipeg offices of Contract Record & Engineering Review and Canadian Engineer. Ten per cent. deposit. Lowest tender not necessarily accepted.

J. J. HACKNEY.
Port Arthur, April 28, 1913. 20

Sealed tenders addressed to the undersigned, and endorsed "Tender for Passenger Elevator and enclosure in the West Block, Ottawa," will be received at this office until 4 p.m. on **Wednesday, May 28, 1913**, for the construction of the works mentioned.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompaniel by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 7, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40173. 20-21

Town of Oshawa, Ontario

Sidewalk Construction

Sealed tenders will be received up to noon of **Saturday, May 31st, 1913,** for the construction of 25,000 square feet, more or less, Cement Concrete Sidewalks in the Town of Oshawa.

Specifications may be obtained from the Town Engineer's Office, Town Hall, Oshawa.

The lowest or any tender not necessarily accepted.

FRANK CHAPPELL,
20-21 Town Engineer.

Sealed Tenders Wanted

Sealed tenders will be received by David Tasker, Secretary, the Public Schools of the Town of Sandwich, Essex County, Ontario, until six o'clock p.m. on the **30th day of May, 1913,** for the general contract of an eight-room reinforced concrete Public School Building, except plumbing, heating and ventilating.

Tenders for plumbing, also for heating and ventilating of the same building will be received at the same place, time and date.

All proposals shall be in accordance with plans and specifications, copies of which are on file at the offices of the Architects Edward C. Van Leyen and Edward A. Schilling, 1115-21 Union Trust Building, Detroit, Michigan, and No. 7 Manning Block, Windsor, Ont.

Copies of the plans and specifications can be had by applying to the aforesaid architects and making a deposit of $20 for the care and safe return of drawings.

Tenders shall be accompanied by a certified cheque in the sum of five per cent. of the amount of proposal, payable to the Public Schools of the Town of Sandwich, as a guarantee to furnish satisfactory bond and entering into contract.

The Board reserves all rights under the specifications to accept or reject any or all bids.

DAVID TASKER, Secretary.
The Public Schools of the Town of Sandwich.
20-21

To Contractors

Sealed tender endorsed "Tender for Work," addressed to the undersigned, will be received at this Department until noon on **Friday, May 23rd,** for electric wiring of the new Government House, Rosedale, Toronto; for alterations to Boiler House and Steam plant at the Institution for the Deaf and Dumb, Belleville, and the Institute for the Blind, Brantford; also for steam heating, electric wiring and plumbing in the Field Husbandry Building, Ontario Agricultural College, Guelph. Plans and specifications can be seen at the above Institutions and at this Department. An accepted bank cheque payable to the Honourable J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender and the bona fide signatures and addresses of two sureties or the bond of a guarantee company, approved by the Department, must accompany each tender.

The Department is not bound to accept the lowest or any tender.

Contractors will please take notice that no extension of time for receiving of tenders will be granted.

By order,
H. F. McNAUGHTON,
[illegible]

Department of Public Works, Ontario,
Toronto, May 8th, 1913.

Newspapers printing this without authority will not be paid for it. 20

Concrete Bridges

Sealed tenders will be received up to 1.30 p.m. on **Tuesday, May 20th,** for the construction of seven reinforced concrete bridges and one concrete abutment for the County of Wellington. For plans and other information apply to the undersigned.

BOWMAN & CONNOR,
Engineers.
D. ANDERSON, Esq.,
Fergus, Ont.
C. G. STICKNEY, Esq.,
19-20 Winfield, Ont.

CITY OF STRATFORD

Tenders for Main Sewer

Sealed tenders, endorsed "Tender for Main Sewer Construction, will be received by the undersigned up to 12 o'clock noon of **Tuesday, May 20th, 1913,** for the supply of material and the construction of approximately one mile of sanitary sewer.

Plans, specifications, forms of tender and all necessary information may be procured at the office of The Contract Record, Toronto, or at the office of the City Engineer, Stratford.

A certified cheque for 2½ per cent. of the amount of tender, payable to the order of the Treasurer of the City of Stratford, must accompany each tender.

The City reserves the right to reject any or all tenders.

A. B. MANSON,
19-20 City Engineer.

Sealed tenders addressed to the undersigned and endorsed "Tender for a Pier at St. John West, N.B.," will be received at this office until 4 p.m. on **Tuesday, May 20, 1913,** for the construction of a Pier at St. John West, in St. John Harbor, St. John County, N.B.

Plans, specification and forms of contract can be seen and forms of tender obtained at this Department and at the offices of F. G. Goodspeed, Esq., District Engineer, St. John, N.B.; Geoffrey Stead, Esq., District Engineer, Chatham, N.B.; The District Engineer's Office, Confederation Life Bldg. Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Post Office Bldg., Montreal, and C. E. W. Dodwell, Esq., District Engineer, Halifax, N.S.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works
Ottawa, May 6, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 41125 20

CITY OF FORT WILLIAM

Waterworks Tunnels

Sealed tenders, addressed to the City Clerk and endorsed "Tenders for Tunnels," will be received up to 12 o'clock noon on **Thursday, May 29th, 1913,** for the construction of three tunnels in Hudson Shale, etc., with reinforced concrete lined shafts, viz.:

Tunnel under Kaministikwia River, 1,275 ft. long, 7 ft. wide, 8 ft. high, 119 ft. deep.

Tunnel under Mission River, 677 ft. long, 5 ft. wide, 6 ft. high, 95 ft. deep.

Tunnel under McKellar River, 629 ft. long, 5 ft. wide, 6 ft. high, 91 ft. deep.

Plans and specifications may be seen and forms of tender may be obtained at the office of T. Aird Murray, Esq., 303 Lumsden Bldg., Toronto, Ont.

Tenders must be sent in on form supplied. The lowest or any tender not necessarily accepted.

A. McNAUGHTON, City Clerk,
Fort William, Ont.
RAY R. KNIGHT, City Engineer,
Fort William, Ont.
T. AIRD MURRAY, Con. Eng.,
Toronto, Ont.
Fort William, April 26, 1913 18-21

Separate sealed tenders addressed to the undersigned, will be received until 4 p.m., **Monday, June 23, 1913,** for the following works on the New Barracks property, Long Branch, near Toronto, Ont., viz:—

(1) Water Works pipe laying. (2) Sewer pipe laying. (3) Pump House, Filter House and Reservoir. (4) Foundations for Water Tower. (5) Steel water tower and supports. (6) Water Works Intake Pipe and Well. (7) Sewage Pumping Station. (8) Sewage Disposal Works. (9) [illegible]

Each tender must be sent in a separate envelope and endorsed, "Tender for Waterworks pipe laying, New Barracks, Toronto, Ont." "Tender for Sewer pipe laying, New Barracks, Toronto, Ont.," etc., as the case may be.

Each person or firm may tender for any number or all of the above works, but a separate tender must be submitted for each work. (No bulk or conditional tender will be entertained).

Plans, specifications and forms of contract can be seen and forms of tender obtained at the office of Messrs. Chipman and Power, Engineers, Mail Building, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual sig[illegible] be given.

[illegible] the order of the Honourable the Minister of [illegible] of the amount of the tender which will be for[illegible] into a contract when called upon to do so, or [illegible] returned.

[illegible]

[illegible]

R. C. DESROCHERS,
[illegible]

[illegible]

[illegible]

CITY OF HAMILTON, ONT.

West End Sewage Disposal Work

[illegible] is extended to [illegible] Tuesday, May 20th, 1913

[illegible] of tender may be obtained from the office of the City Engineer, Hamilton, Ont.

S. H. KENT, City Clerk.

Hamilton, Ont.,
May [illegible], 1913. 20-21

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at any or all our offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—420 Pender Street.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Dry Dock at Lauzon, Que.," will be received at this office until 4 p.m. on **Monday, June 23, 1913**, for the construction of a Dry Dock at Lauzon, in the County of Levis, Que.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. E. W. Dodwell, Esq., District Engineer, Halifax, N.S.; J. K. Scammell, Esq., District Engineer, St. John, N.B.; Chas. Chapais, Esq., District Engineer, Post Office, Quebec; J. L. Michaud, Esq., District Engineer, Post Office, Montreal; District Engineer's Office, Confederation Life Building, Toronto; H. J. Lamb, Esq., District Engineer, Windsor, Ont.; W. Z. Earle, Esq., District Engineer, Ashdown Building, Winnipeg, and on application to the Postmaster at Lauzon, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40715. 20-21

TOWN OF BOWMANVILLE
PROVINCE OF ONTARIO

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on

Friday, May 30th, 1913

for the construction of

Sewage Disposal Works

Plans and specifications may be seen at the Town Hall, Bowmanville, and at the office of the Engineers, Toronto.

Deposit cheque of $500 required.

No tender necessarily accepted.

S. C. HILLIER, Esq., Mayor.
JOHN LYLE, Esq., Town Clerk.
CHIPMAN & POWER, Engineers.

20-21

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

McMyler Derricks For Sale

Locomotive cranes, clam shell buckets, hoisting engines, steam shovel, pile driver, steam hammer, diving suits, stiff leg derricks, turnover buckets, two (2) marine engines, boilers, fuel lighter with whirley aboard. Address

Cleveland & Erie Machinery Co.
C **1515 Rockefeller Bldg., Cleveland, O.**

Get Our Booklet of SECOND-HAND MACHINERY

Steam Shovels, Locomotive Cranes, Rock Crushers, Trenching Machines, Hoisting Engines, Locomotives, Traction Engines, Dredges, Dump Cars, etc. WRITE TO-DAY

WILLIS SHAW MACHINERY CO.
39 So. La Salle St., Chicago, Ill. 19-T.F.

For Sale

Tenders wanted for purchase in whole or in part of the following apparatus:—

1 Goldie McCullough Wheelock Engine, 125 h.p. 20 x 50 x 16 x 50.
1 Laurie Corliss Engine, 90 h.p., 13 x 30.
2 Northey condensers and pumps, 8 x 12 x 12.
36 ft. 4-in. line shafting, complete with vertical shaft hangers and boxes and 2 friction clutches.
2 belt tighteners.
1 pulley, 46 x 23½.
1 pulley, 30 x 22.
2 pulleys, 19½ x 17.
1 pulley, 17½ x 72.
1 pulley, 5 x 28.
79 ft. 2-ply, 17½-in. leather belt.
61 ft. 2-ply 16-in. leather belt.
82 ft. 19½-in. leather belt.
Approximately 100 ft. 4-in. steam pipe with valves and fittings complete.

All the above apparatus in first class shape but has been discarded owing to the introduction of Hydro Electric Power and may be seen at thePumping Station, St. Marys' Ontario.

H. M. MILLER,
Sec. W. L. & H. Commission.
19-22 St. Marys, Ont.

FOR SALE

FOR SALE—One Beatty one yard Clam Shell Bucket in very good repair. Reason for selling install larger bucket. Apply Cadwell Sand & Gravel Company, Ltd., Windsor, Ont. 20-21

Any concerns or individuals in building and construction business who desire to tender for contracts to architects, builders and owners write or enclose business card to Advertiser, who will introduce a protfiable proposition. This particularly applies to new firms and those seeking means of extending their business. Box 769, Contract Record, Toronto, Ont. 17-20

Situations Vacant

Wanted—Manager for a Western Construction Company who will take a financial interest in business. Must have thorough knowledge of building. The company has a small mill in connection with their present business. Present manager retiring. This is a good opening for the right man. Address all correspondence to Box 793, Contract Record, Toronto.

Chatham, Ont.
Newspaper office and plant of the Chatham Planet burned. Loss $75,000. Will be rebuilt. Insurance $50,000.

Guelph, Ont.
Husbandry building at Agricultural College. Tenders received by Provincial Government, Dept. of Public Works, Secretary, H. F. McNaughton, Toronto, until May 23rd, for steam heating and plumbing.

Montreal, Que.
Convent planned for Catholic School Commissioners, Verdun. Tenders received by Sec.-treas., O. Deguise, until May 23rd. Plans and specifications at office of architect, J. E. A. Benoit, 1198 Wellington street.

Toronto, Ont.
Government House electric wiring. Plans at Dept. office and at Government House, Tenders received by Provincial Govt., Dept. of Public Works. Secretary, H. F. McNaughton, until May 23. Architect, F. R. Heakes, Parliament Buildings.

For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where "the breezy call of incense breathing morn" will put new life in mind and body. Muskoka offers more real healthful enjoyment for less money than any other resort in the world.

Four cottages to rent $125 to $200 on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box 771.

Contract Record, Toronto Ont.

High Grade Contractor's Plant

STEAM SHOVELS—2 Bucyrus 70-C. Shop Nos. 1446 and 1520. New in April and November, 1912. 3 Marion Model 60. Shop Nos. 2110, 2358 and 2361. New 1910 and 1911.

LOCOMOTIVES 36 INCH GAUGE 18 Porter 10x16 inch 18 ton four wheel, saddle tanks-steam brakes. New 1911 and 1912.

DUMP CARS, 36 INCH GAUGE 180 K. and J., Western and Koppel, 4 yd. 2 way. New in 1911 and 1912.

LOCOMOTIVE CRANE—1 Brown Hoist, 15 ton, 8 wheel, 2 drums, standard gauge with 44 ft. 6 inch boom, with outriggers. New 1911.

AIR COMPRESSORS 3 Ingersoll-Rand Imperial Corliss XC-3 class, 18x30x28x17x24 inch, capacity 2381 cubic ft. of free air per minute. As good as new.

Send for List No. 53 Which Includes

AIR REHEATERS
AFTERCOOLERS
AIR SEPARATORS
BELT CONVEYOR
BLOWERS
BOILERS
BUCKETS
CARS
CONCRETE MIXERS
CONDENSERS
DERRICKS
DRILLS
DRILL SHARPENERS
ELECTRICAL EQUIPMENT
FLOATING EQUIPMENT
HOISTING ENGINES
PIPE
PUMPS
RAILS
WELL DRILLS

E. C. Sherwood, Hudson Terminal Bldg., New York City

19-20

Jennings & Ross, Limited

Engineers and Contractors
TORONTO

Royal Bank Building, King and Spadina

Phone Ade. 282

Showing progress of building 250 ft. x 300 ft. for

Rolph & Clark, Limited

?

Do you want Specialists to figure on your

HEATING?

Conduit Installations?

(Both underground and in buildings)

Transmission Lines?

Power Plant?

Locomotive Washout Plants?

then ask

DIETRICH

LIMITED

300 Read Bldg. MONTREAL

Filing Plans

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record and Engineering Review" offices.

Contractors and manufacturers read the "Contract Record and Engineering Review". It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders, put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

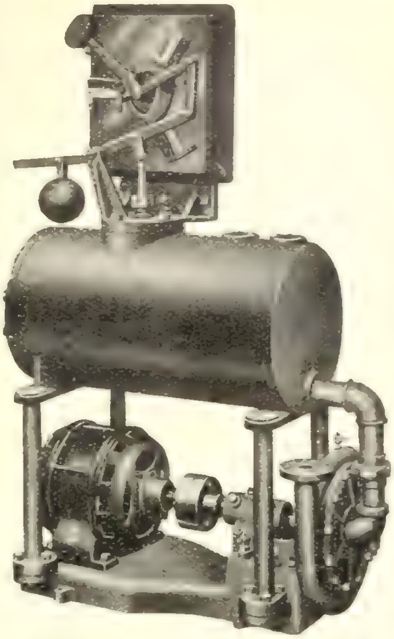
Contract Record and Engineering Review

Montreal—119 Board of Trade
Toronto—220 King St. West
Winnipeg—Commercial Travellers' Bldg.
Vancouver— 429 Pender Street

CENTRIFUGAL PUMPS

to take care of the

Water Condensation



We show here a simple and effective means of draining steam jackets, heating systems, steam coils, drying cylinders, etc. The condensed steam is led to the inlet at the top of the receiver and falls to the bottom. The water in rising lifts a float switch and the motor starts and stops the pump automatically. This arrangement obviates the use of steam traps or tanks and, in addition, automatically returns to the boiler all water of condensation.

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for Water Works, Power, Irrigation, etc.

Withstands 250 lb. working pressure.

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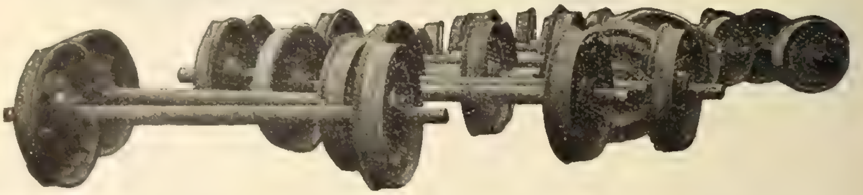

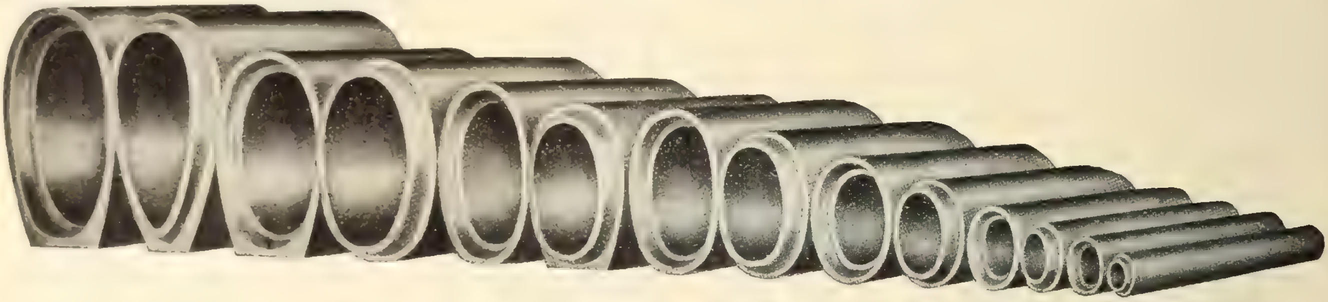

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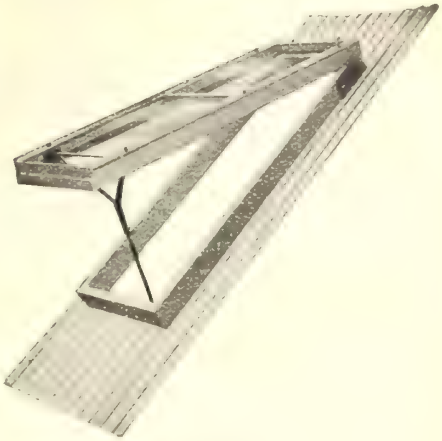

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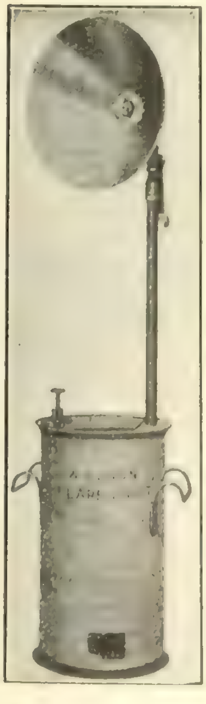

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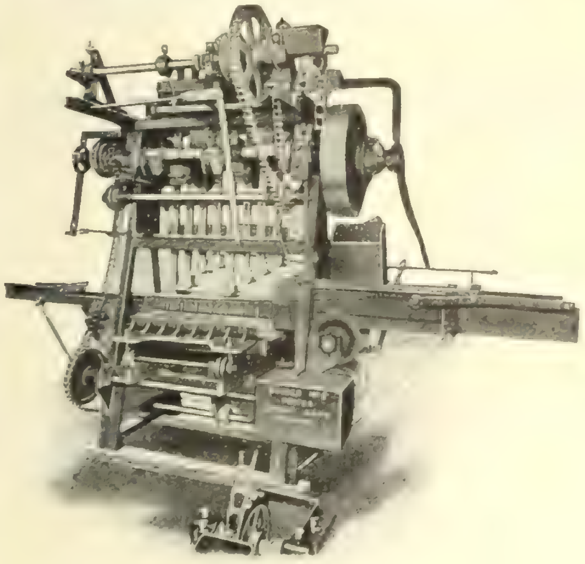

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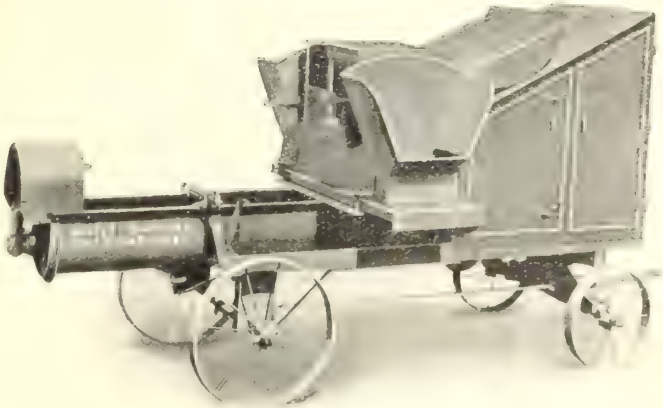

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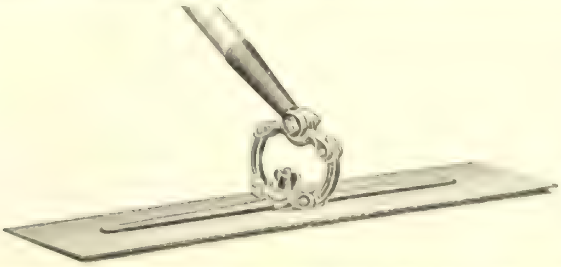

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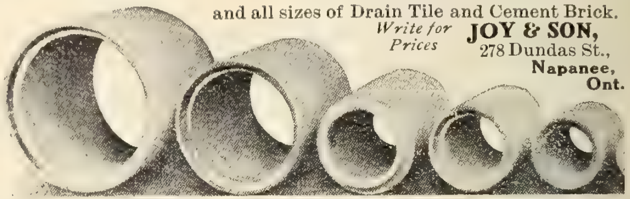

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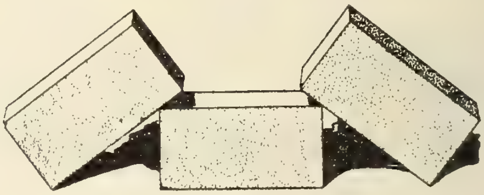

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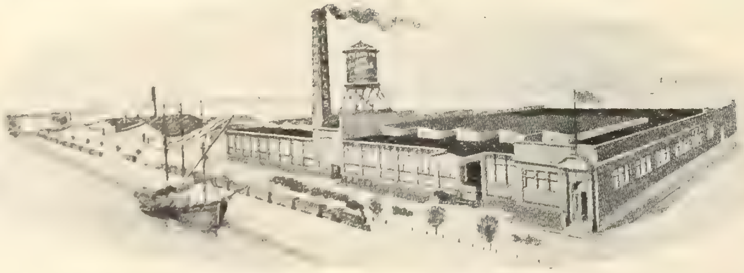

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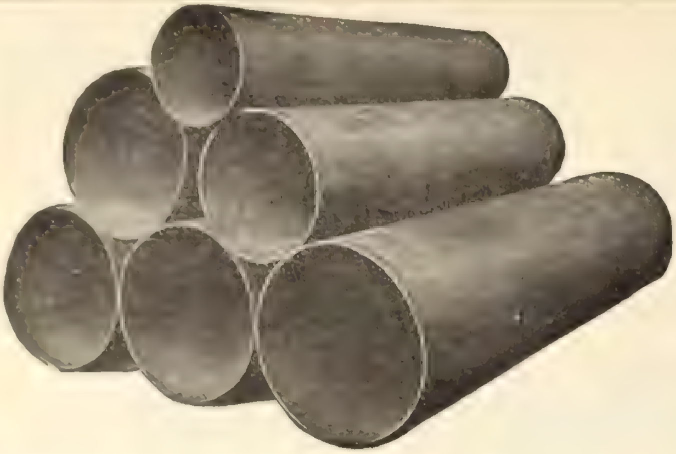

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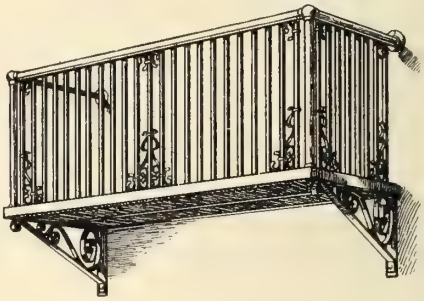

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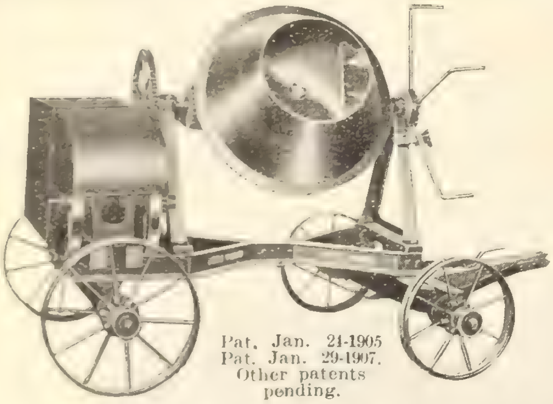

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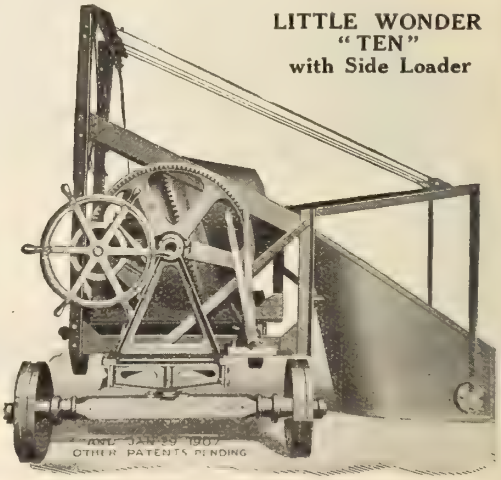

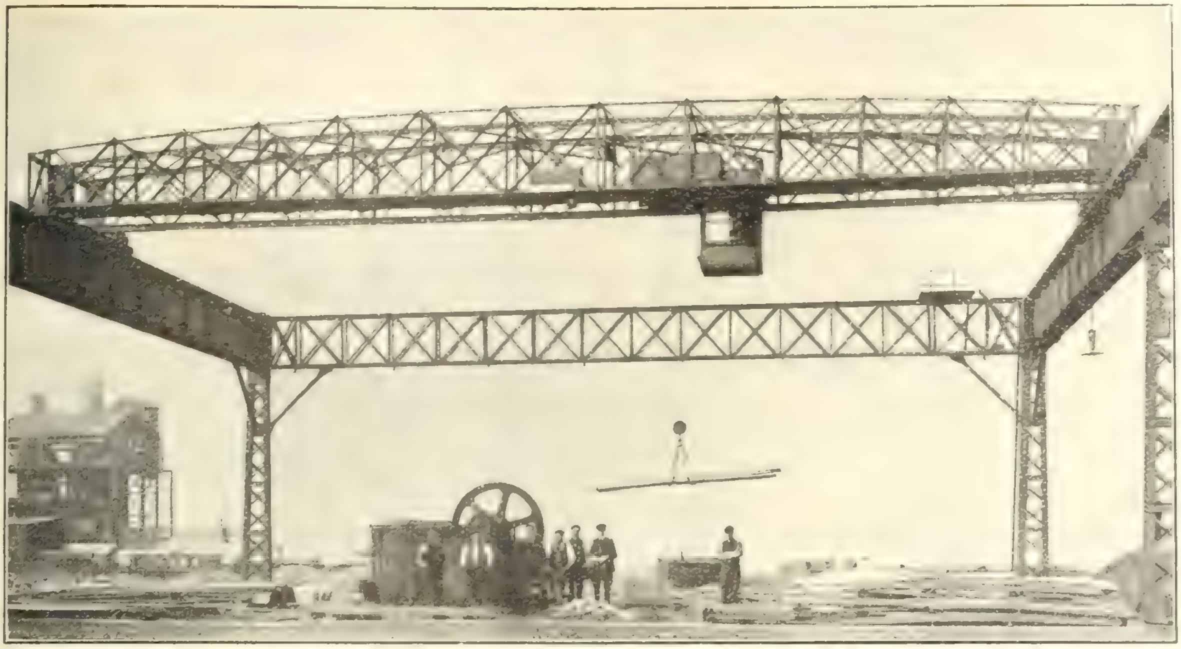

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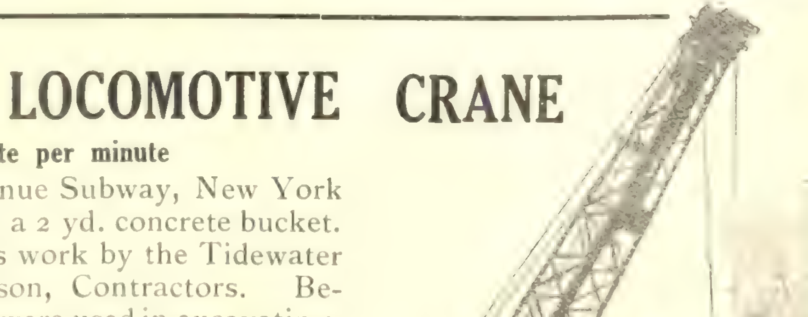

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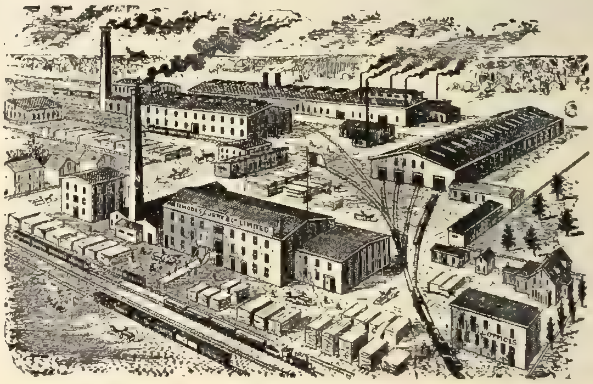

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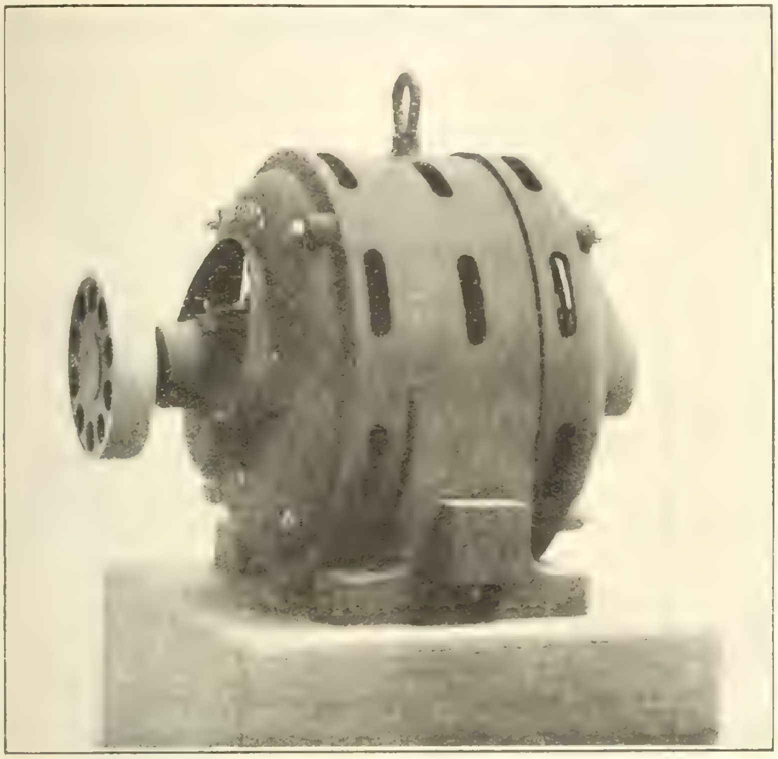

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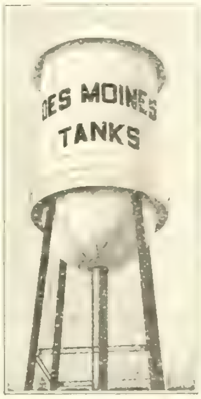

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3 inches to 60 inches diameter

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Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

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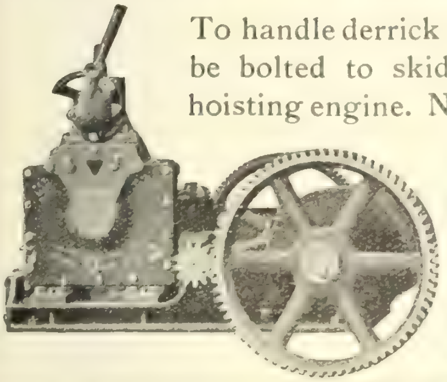

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Sole Manufacturers under Canadian and U. S. Letters Patent
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Lake or Rail Shipments

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Lime	Fire Brick
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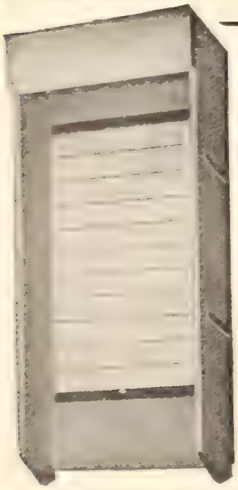

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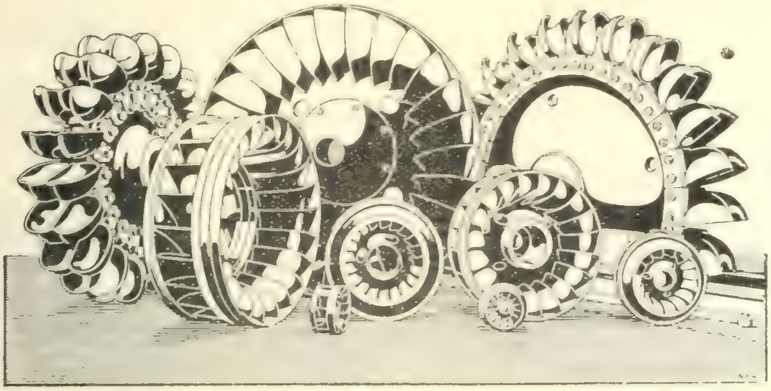

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the most effective water resistant. These men have used it on tunnels, dams, reservoirs, swimming pools, sewers, foundations, bridges, aqueducts, viaducts, water towers, water tanks, cellars, floors, roofs, etc., etc.

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[illegible] delivered at [illegible]

	Per M
[illegible]	$18 00
[illegible]	18 00
[illegible]	13 00
[illegible]	13 00
Wire cut bricks for foundation work ...	12 00
[illegible]	15 00
[illegible], from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to [illegible]	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
[illegible] 1 Hemlock, [illegible]	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

[illegible]

1 in. common pine 8 to 12 in. wide [illegible] ...	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving..	36 00	42 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

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4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

[illegible]

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

[illegible]

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

		Star	D.D.
10 to 25 united inches	....	$4 25	$ 6 25
[illegible] 40		4 60	6 75
41 to 50 "	....	5 10	7 50
[illegible]		5 35	8 50
[illegible] 70		5 75	9 75
71 to 80 "	....	6 25	11 00
[illegible] 85		7 00	12 50
86 to 90 "	....		15 00
91 to 95 "	....		17 50
96 to 100 "	....		20 50
101 to 105 "	....		24 00
106 to 110 "	....		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
[illegible]	3 85	6 00
[illegible]	4 10	6 50
70	4 35	7 00
80	4 85	7 50
[illegible]		9 75
95		10 75
[illegible]		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51 60	4 75	7 00
61 70		8 00
71 80		9 00
81 85		10 00
86 90		11 00
91 95		13 00
96 100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

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Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 15 per cent.; lead waste, $9.00, less 15 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 40 per cent.; pig lead, 5c lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

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Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

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Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

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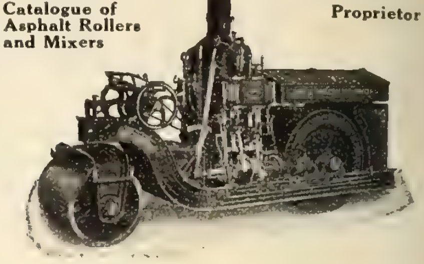
Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.



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Pedlar specialties include metal fire retardant studding, furring, track, etc. These, with Pedlar metal lath and concrete, make a fire-proof partition wall. For factory ceilings either lath and metal furring, Ferro-Dovetail plates, or Pedlar Steel ceilings may be used. Ask for details.

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Pedlar Wall Bonds for brick construction, bind the wall into a strong, substantial structure of brick, which cannot separate under the stresses of vibration or fire. Free sample on request.

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Metal skylights with or without Pedlar Vents are made to specification for ridge roofs, saw-tooth roofs, flat roofs, to work with Ferro-Dovetail steel roof slabs or Pedlar "George" metal shingle on wood rafters protected by Pedlar metal lath and cement plaster. Write particulars to us regarding your needs.

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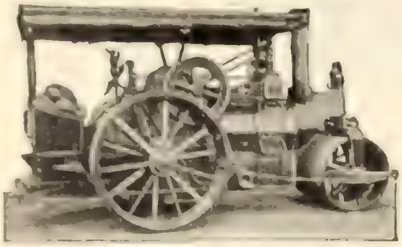

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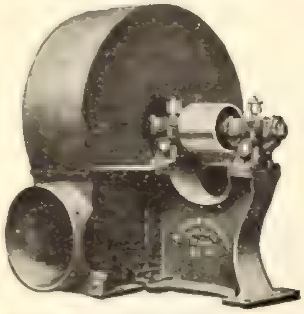

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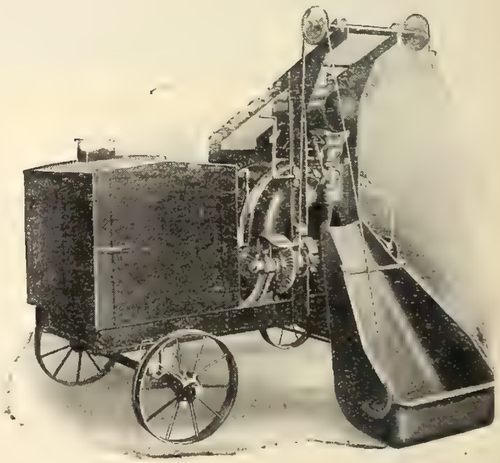

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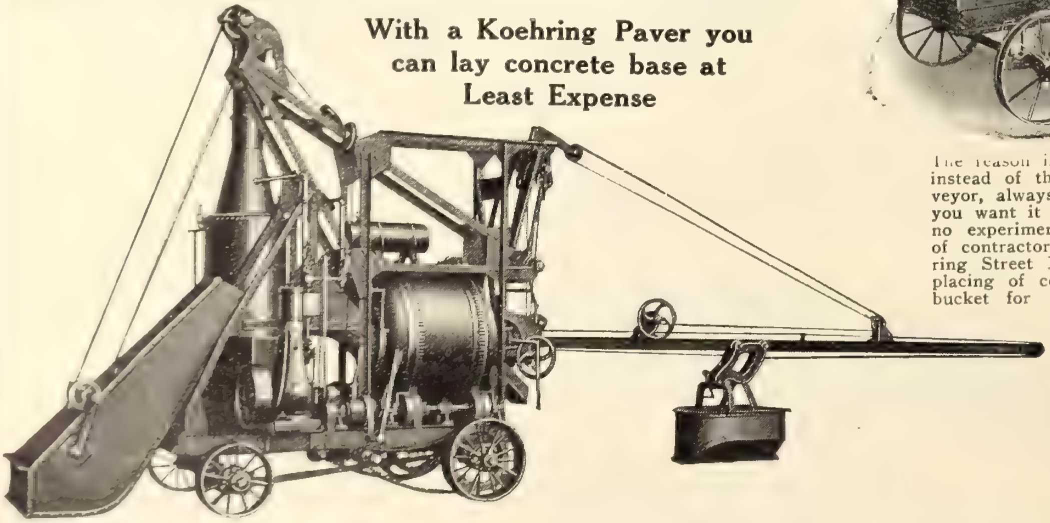

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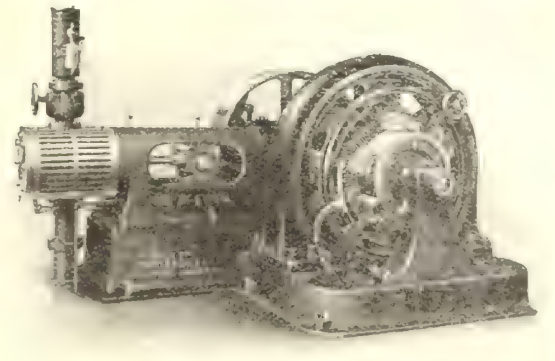

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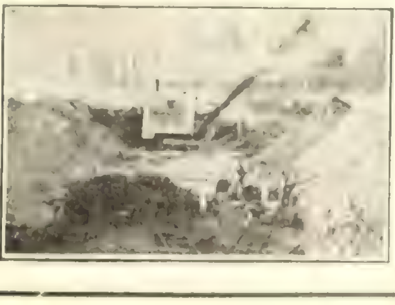

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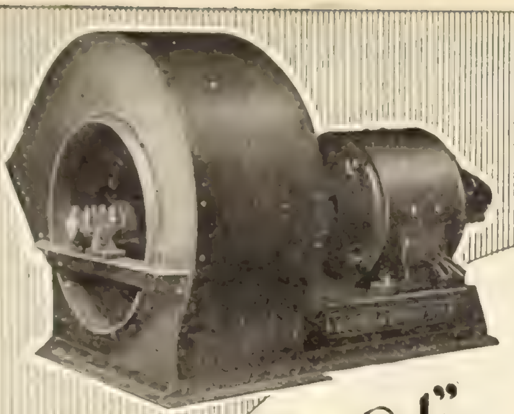

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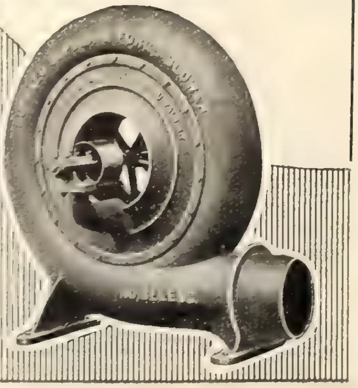

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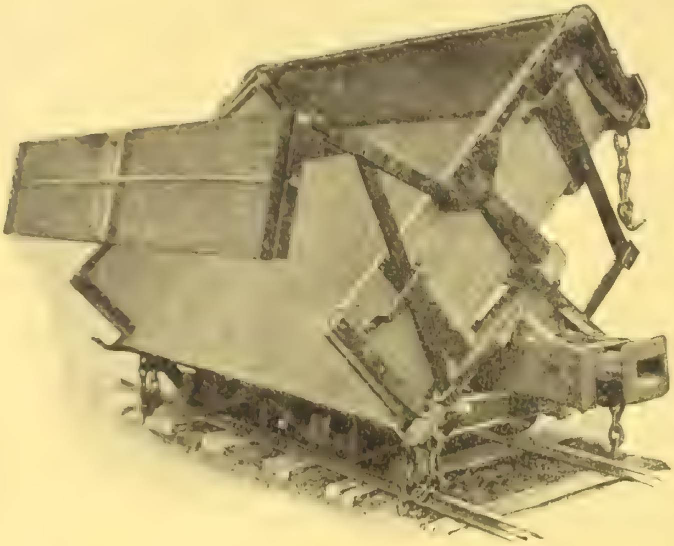

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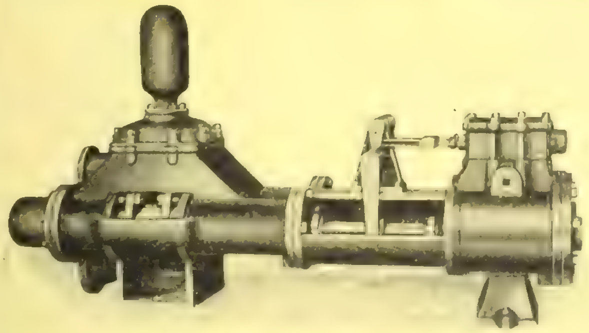

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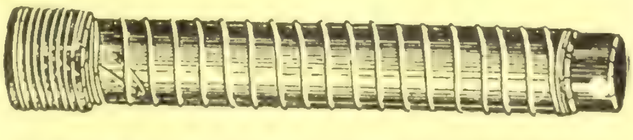

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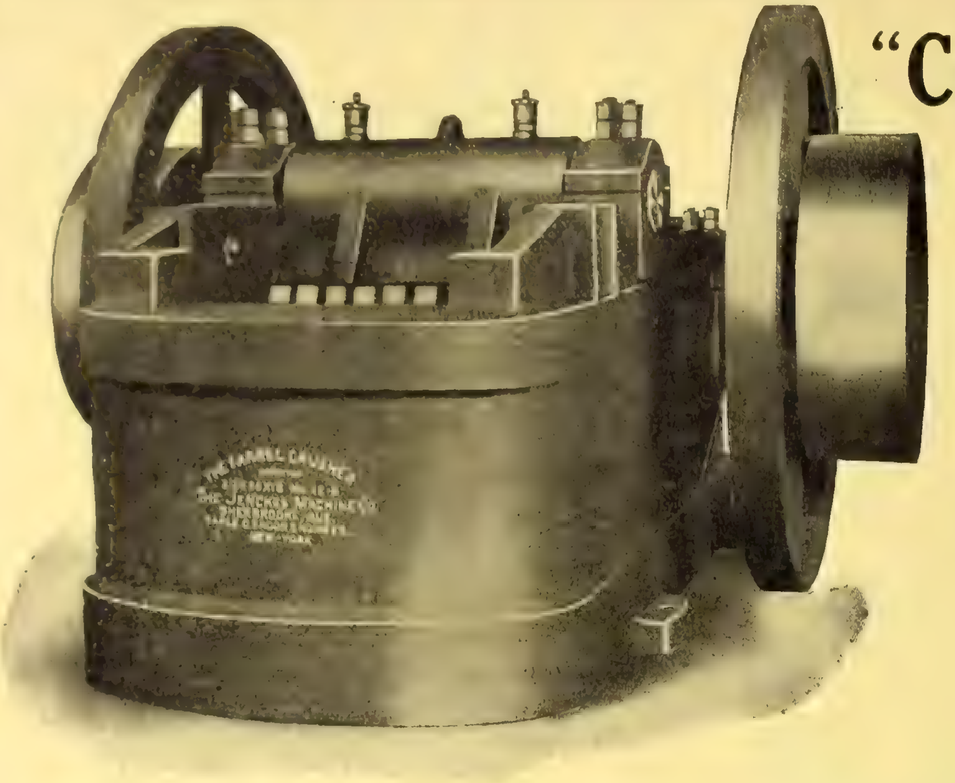

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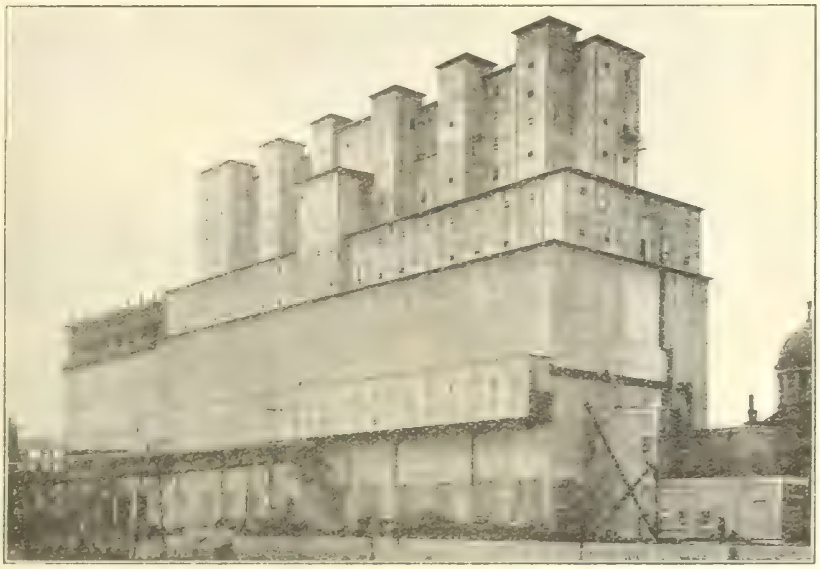

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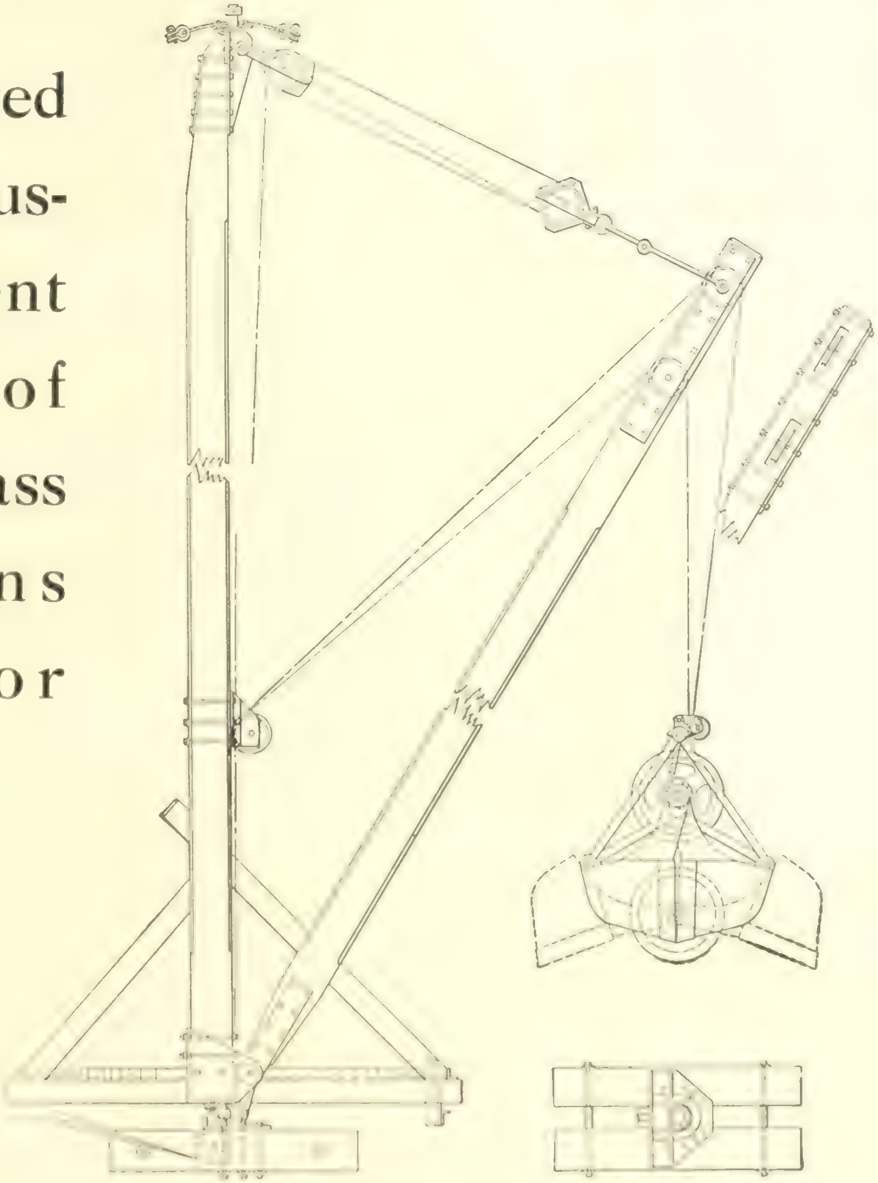

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Wettlaufer Bros.

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Galt Stove & Furnace Co.

Coal Handling Apparatus
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Mun. Eng. & Contracting Co.
Mussens Limited.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
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Improved Equipment Co.

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Canadian Ingersoll-Rand Co.
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Jenckes Machine Co.
Hopkins & Co., F. H.
Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F.

Hoisting Engines
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

Don Valley Clay Products

For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Lumsden Building, Toronto

J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.

Don Valley Fireproofing, Bricks and Tile used throughout.

Traders Bank, Toronto

Carrere & Hastings and F. S. Baker, Associate Architects.

Don Valley Porous Terra Cotta Fireproofing and 2,0000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

Royal Bank, Toronto

Eustace G. Bird associated with Carrere & Hastings, Architects. Norcross Bros. Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Bell Telephone Building

Adelaide Street, Toronto

W. J. Carmichael, Architect. Wickett, [illegible] Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

"Steelcrete" Concrete Reinforcement

MAXIMUM EFFICIENCY AT MINIMUM COST

Bridge at Campbellford, Ont. "Steelcrete" Floor Reinforcement

One of the more than two hundred highway bridges throughout Canada with Steelcrete Expanded Metal Reinforcing for the floor slabs.

Slabs of concrete reinforced with "Steelcrete" Expanded Metal make a permanent bridge floor of the greatest strength, at the least cost, and with the least amount of superimposed dead load on the bridge. "Steelcrete" possesses an absolutely mechanical bond against vibration. It lies flat. Once placed, disarrangement is impossible. The meshes are diamond shaped, the joints absolutely rigid. There are no corrugated or twisted strands. When the load is applied there is no straightening out to split the concrete before the reinforcement comes into tension.

Specify "Steelcrete" for

Floors, Roofs, Domes,
Tanks, Dams, Piers,
Sidewalks,
Foundations,
Warehouses,
Power Plants

Made in Canada:—Two Factories in Toronto, one in St. Catharines, Ont.

STEEL & RADIATION, LIMITED

TORONTO
Head Office—Fraser Ave.

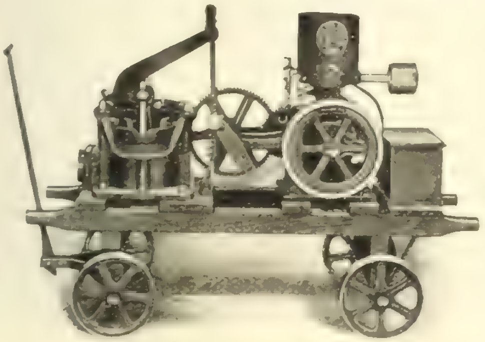
MONTREAL
138 Craig Street West

—AGENTS—

F. S. Coombs, Halifax, N.S.
R. Max McCarty, St. John, N.B.
N. T. Dinnen & Co., Winnipeg, Man.
Canadian Supply & Equipment Co., Ltd., Calgary & Edmonton, Alta.
E. G. Cullen, Vancouver, B.C.

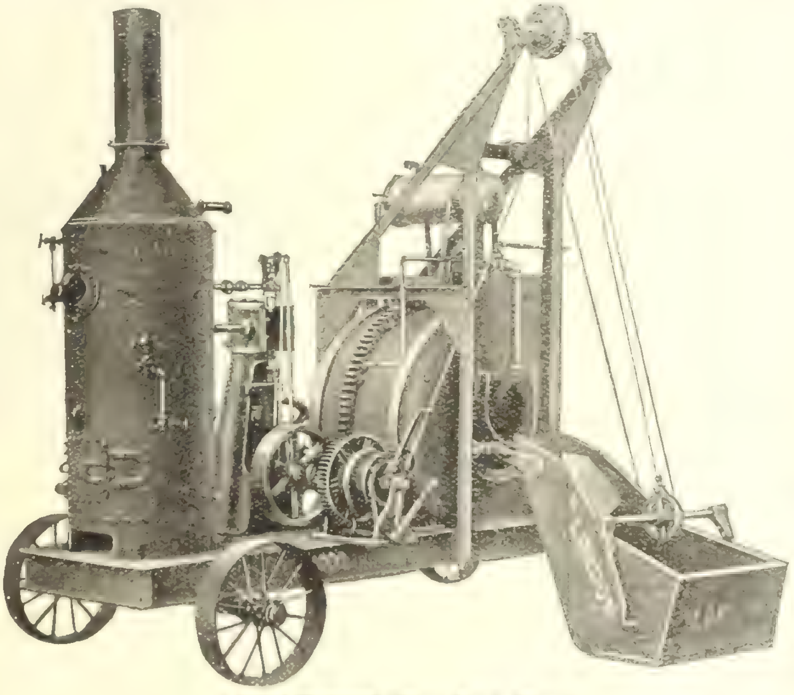
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



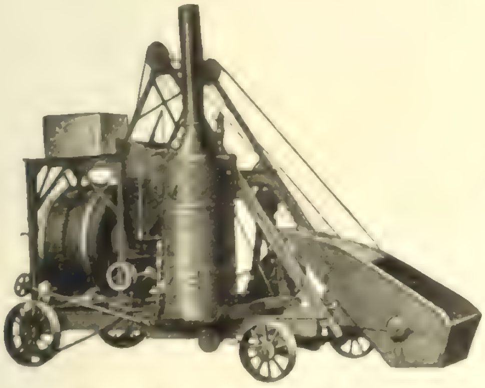
Power Diaphragm Pump

We are the largest manufacturers of Concrete Machinery in Canada.



London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power ; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Cabell St. and Kitchener Ave., LONDON, ONT.

BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
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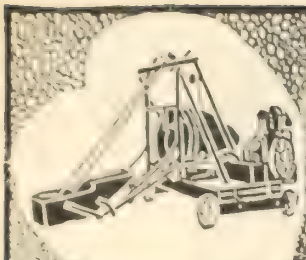
HALIFAX (106 Pleasant St.) G. B. Oland, Mgr.

AGENCIES:

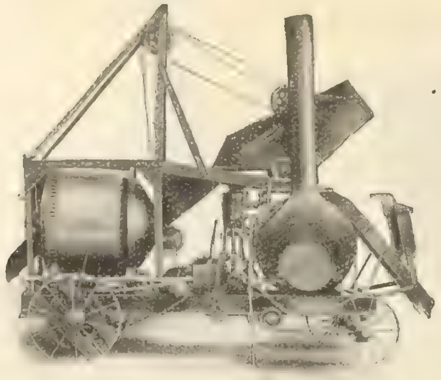
VANCOUVER, B. C. Equipment Co. MOOSE JAW, SASK., Bridge & Iron Co., Ltd. REGINA, H A Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co



Wettlaufer Bro's
IMPROVED CONCRETE & ROAD MACHINERY

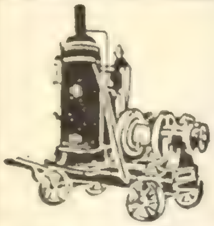
MIXERS

HOISTS



We cannot give you any idea of the perfection of this mixer in an advertisement. If you are interested come and see the mixer—it is worth your while.

It will pay you to send for catalogue giving full description of this mixer.



The Wettlaufer Story

No. 4

Now take that last City Hall job. There was close enough contract time there. Well, a No. 6 was wanted in a hurry to do 30 cubic yards per hour—we couldn't do it so we put in a No. 4 with a capacity of 12 cubic yards per hour. They took it, worked it, rushed it hard for two months day in and day out and got the job done on time. No breakdowns—no delays. Mixer working over capacity and doing perfect mixing all the time.

That's a good enough test for the breaking strain of any mixer. True enough, but—**it takes a Whettlaufer Heartshape to do it.**

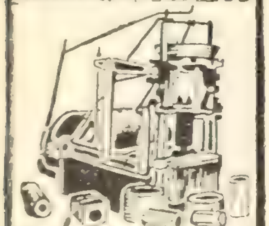
TILE MACHINES

BRICK MACHINES

Wettlaufer Heartshape Mixers

will **stand the strain**—will do the hardest work and give **perfect satisfaction all the time.**

You want **efficiency** in your concrete machinery—**hard work** and **good work**—the Wettlaufer New Heartshape Stationary Drum Traction Mixer with Horizontal Boiler will give it to you.



CRUSHERS

PUMPS

Come and see it working—Continuous Demonstrations at

Wettlaufer Brothers
178 Spadina, Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

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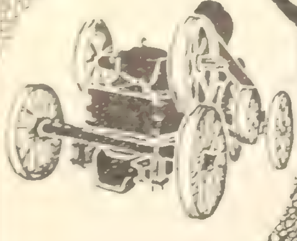
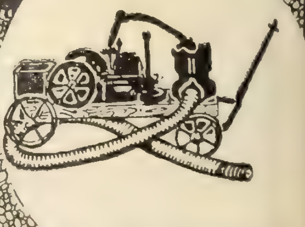
Montreal Office and Warerooms: 316 Lagauchetiere St. W.



THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

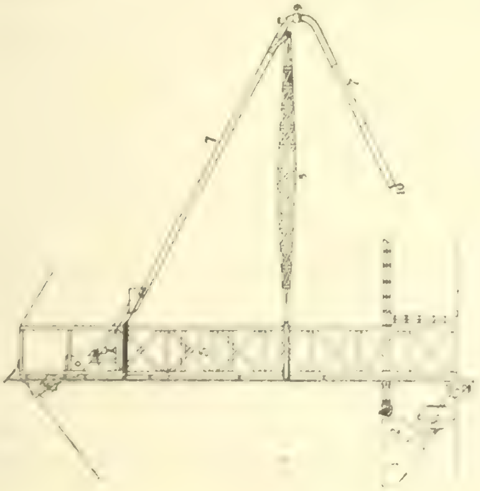


Note tremendous metal weight on this floor. Entire building of Alsen's Cement reinforced concrete.

Alsen's Cement

was selected in 1905 for the Panama Canal in preference at equal prices and has exceeded those severe requirements. Sold under a guarantee other Portlands cannot make in good faith. Other brands have been supplied only on modified specifications.

Alsen's American Portland Cement Works
45 BROADWAY, NEW YORK



Gravity System
Distributing Concrete

A system that improves the concrete and reduces the cost.

Information gladly furnished and Estimates given on any work.

Canadian Concrete Appliance Co. Limited
Sole Licensees for Canada
613 Vancouver Block, VANCOUVER, B. C.
Eastern Representatives
STINSON REEB BUILDERS' SUPPLY CO., LTD., MONTREAL, P.Q.

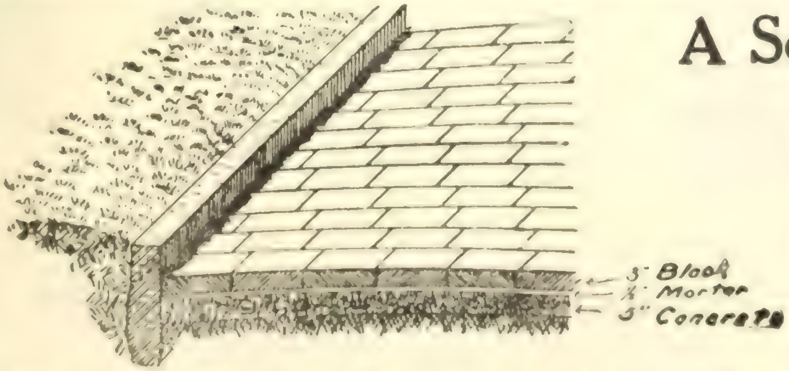
"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL



A Scientific Pavement

must be

Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and Easily Cleaned.

These requirements are met by
Asphalt Block Pavements
Send for Descriptive Literature

The Ontario Asphalt Block Company, Limited - Windsor, Ont.

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Standard Underground Cable Co.
of Canada, Limited

Interior Finish and Doors
[illegible] Limited
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[illegible] & Co

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Canadian Buffalo Forge Co.
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Canadian Sirocco Co.
[illegible] Machinery Mfg. Co.

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Lime Kilns
Improved Equipment Co.

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Canadian Boving Co.
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Ferranti Electrical Mfg. Co.
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Meters, Water
Hopkins & Co., F. H.
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Neptune Meter Co.

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Canadian Mineral Rubber Co.
Dominion Paint Works.
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Dominion Paint Works.
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Dominion Concrete Co.
Dominion Wood Pipe Co.
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National Iron Works.
National Pipe & Foundry Co.
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Piggott & Co., Thos.

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Lecky & Collis.

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Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

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Alabastine Company.
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

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Canadian Ingersoll-Rand Co.

Plumbers' Supplies
Standard Ideal Company .

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Canadian Ingersoll-Rand Co.

Portable Saws
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

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Inglis Company, John.
Jenckes Machine Company.
Canada Foundry Company.
Waterous Engine Works.

Pumps and Pumping Machinery
Beatty & Sons, M.
Canada Foundry Co.
Canadian Boving Co.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
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Escher Wyss & Co.
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Hopkins & Co., F. H.
Inglis & Co., John.
McDougall Caledonian Iron Wks.
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Mussens Limited.
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Improved Equipment Co.
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Hopkins & Co., F. H.
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Linde British Refrigeration Co.

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Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.
Steel & Radiation Ltd.
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Turner, C. A. P.

Revolving Stone Screens
Greening Wire Co., B.

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Canadian Mineral Rubber Co.
Barber Asphalt Paving Co.
Asphalt & Supply Co.

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Dore & Fils.
Erie Machine Shops.
Lecky & Collis.
Morrison & Co., T. A.
Mussens Limited.
Waterous Engine Works Co.
Western Wheeled Scraper Co.

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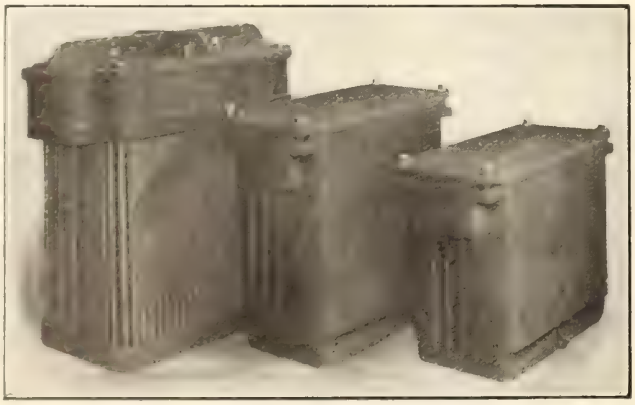
Asbestos Mfg. Company.
Barber Asphalt Paving Co.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

Power Logic

Reduced Loss
Increased Profit

Ferranti
Transformers



Three Phase Pole or Station Transformers

The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one because of the great reduction in energy-loss made possible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

Write us for particulars

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

Office of Dominion Iron & Steel Co., Ltd.
Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

In Building Canals

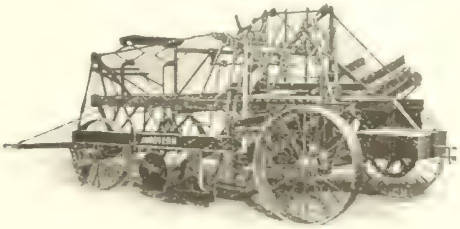
Excavating Ditches, Reservoirs, Loading Wagons, Building Levees, Embankments, etc., there's an unequaled saving in using the sturdy

Western Elevating Grader

Will move 1000 cubic yards per day. Free from complicated parts. Built strong. No annoying breakdowns. Has made records as to strength and durability. There are many "reasons why" you need the Western Elevating Grader. Our Catalog will tell you.

Write today.

Western Wheeled Scraper Co.
Aurora, Illinois
Earth and Stone Handling Machinery
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia



Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS	1903	$ 0.00	1908	$ 93.26
	1904	3.30	1909	200.46
	1905	9.35	1910	14.07
	1906	37.33	1911	2.29
	1907	16.11		

Total $376.17 or $5\frac{2}{3}$c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont.
Limited

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Canadian Fairbanks-Morse Co.

Safes and Vaults
Taylor, J. & J.

Sand and Gravel
[illegible]
Sand and Supplies Limited.
[illegible] and Gravel Co.
[illegible]

Screens
Canada Wire & Iron Goods Co.
Greening Wire Mfg. Co., B.

Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Sewer Pipe
Britnell & Company.
Canada Iron Corporation.
Dominion Sewer Pipe Co.
Gartshore Thomson Pipe Co.
Joy & Son.
National Iron Works.
Ontario Lime Co., Ltd.
Ontario Sewer Pipe Co.
Smyth & Ryan.
Standard Clay Products Ltd.
Nova Scotia Clay Works Ltd.

Sewer Trenching
Lecky & Collis
Austin Mfg. Co.
Municipal Engineering.

Sound Deadening
Cabot Inc., Samuel.

Shovels (Steam)
Browning Engineering Co.
Beatty & Sons, M.
Canada Foundry Co., F. H.
Hopkins & Co., F. H.
Montreal Locomotive Works.
Mussens Limited.
Thew Automatic Shovel Co.

Shovels
Lundy Shovel & Tool Co.

Smoke Stacks
Des Moines Bridge Co.
Hamilton Mfg. Co., Wm.

Stains, Shingle, Cement & Brick
Cabot, Inc., Samuel.
Pinchin, Johnson & Co.

Steam Apparatus
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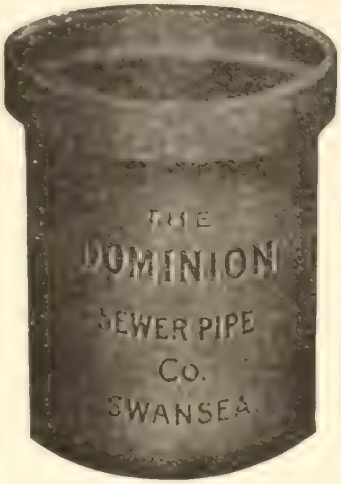

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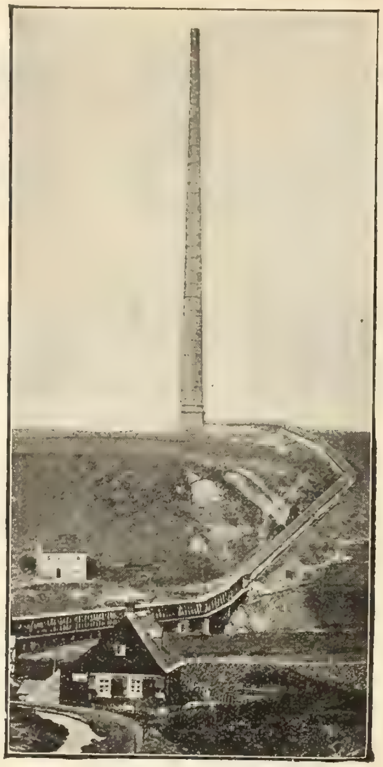

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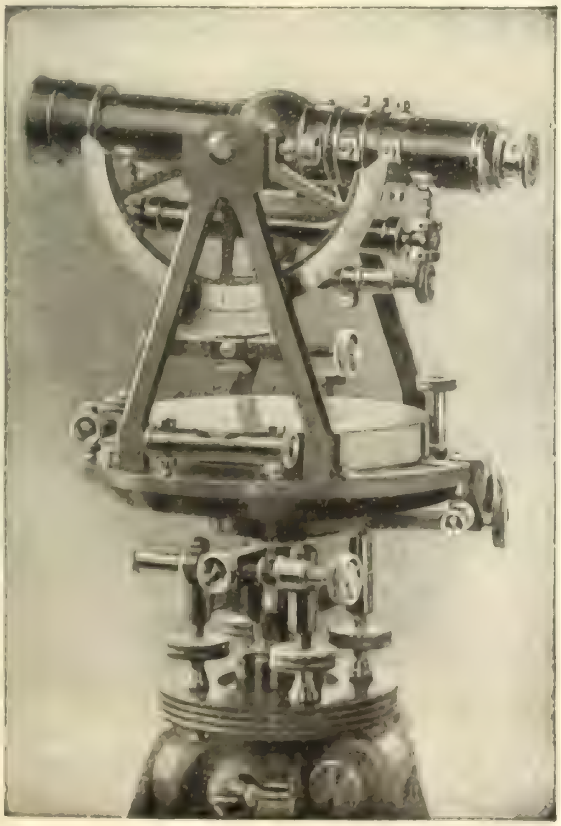

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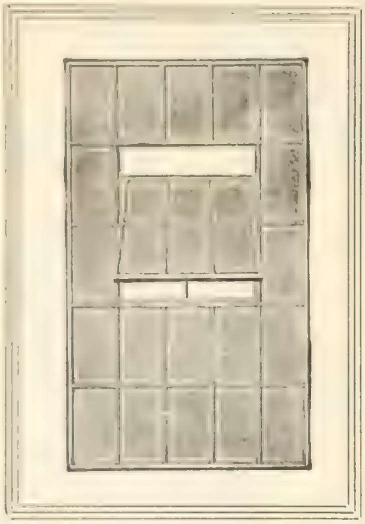

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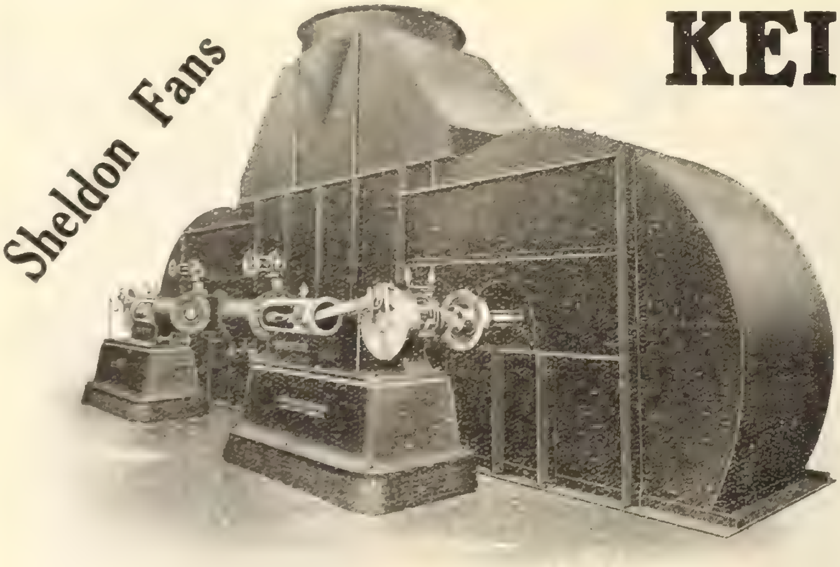

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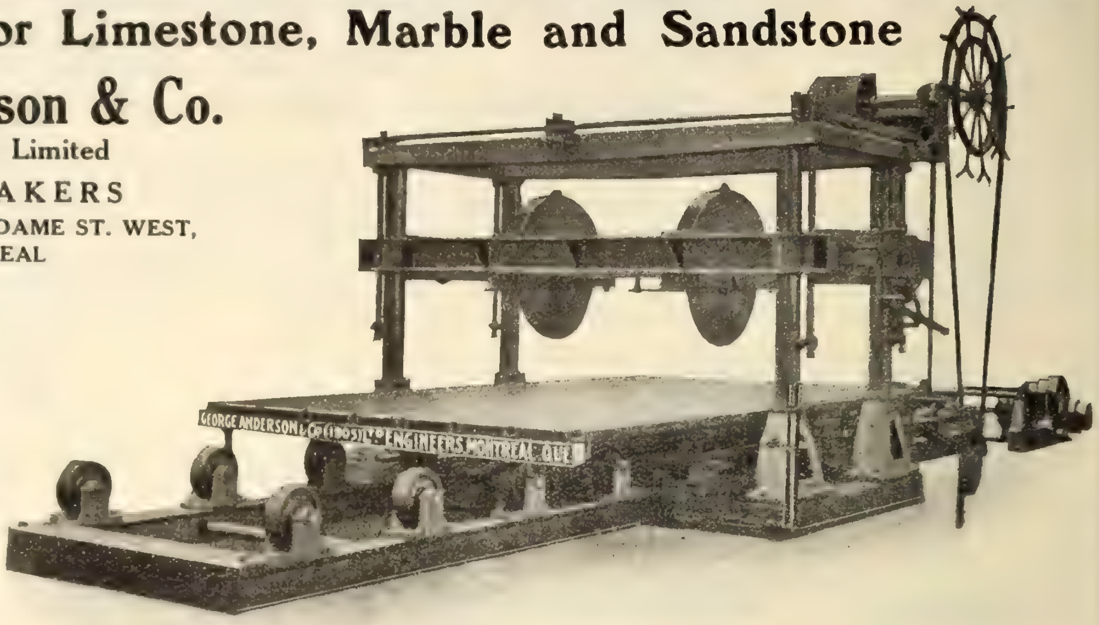

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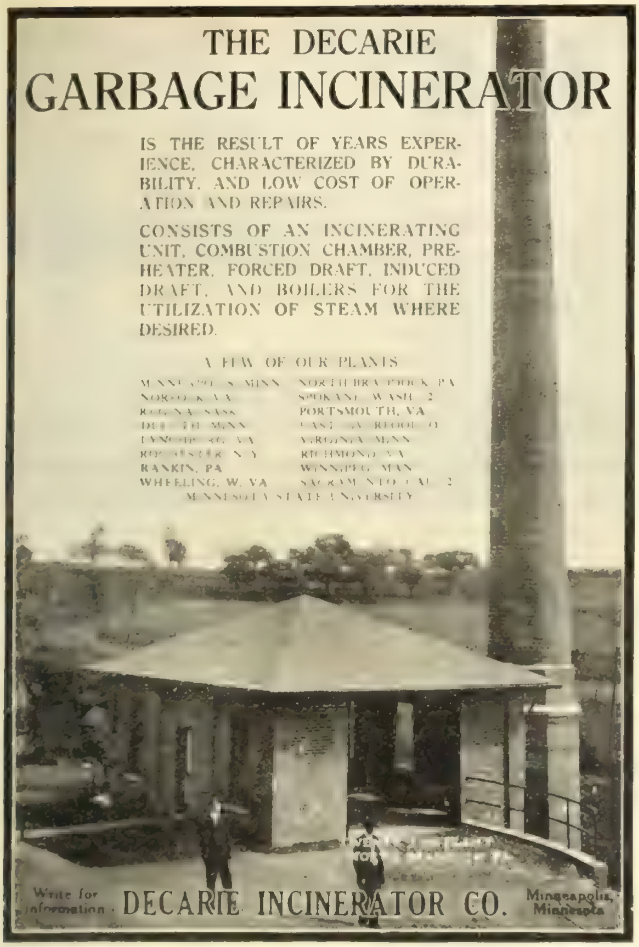

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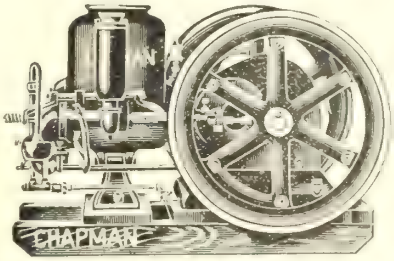

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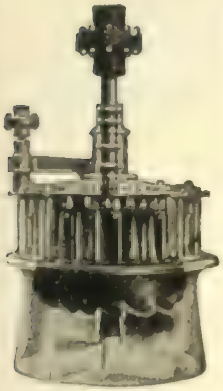

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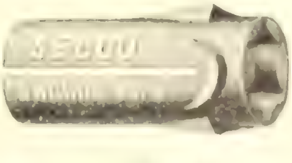

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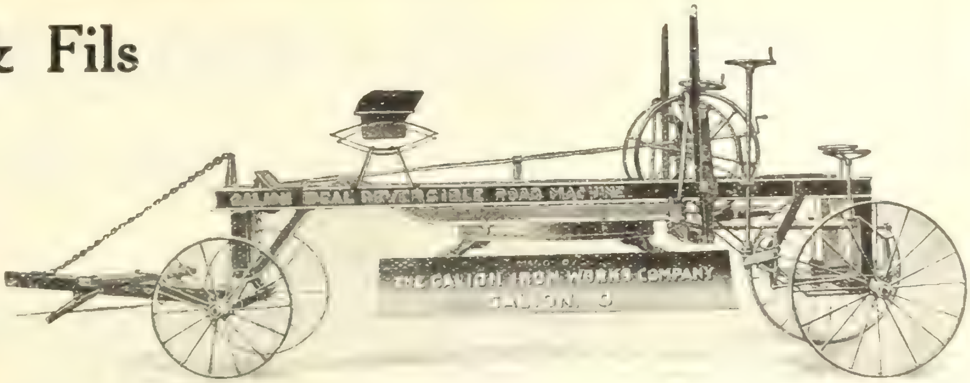
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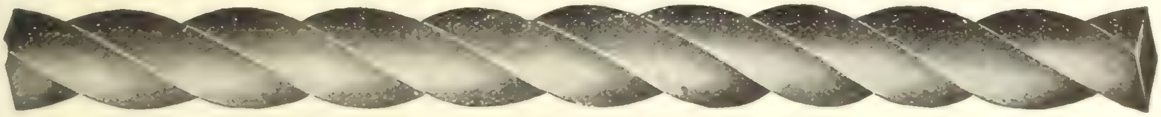

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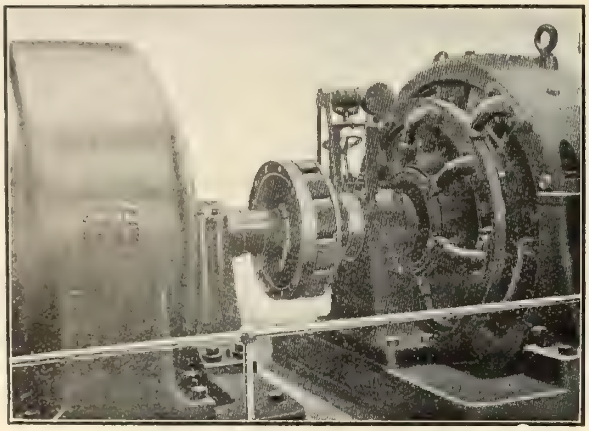

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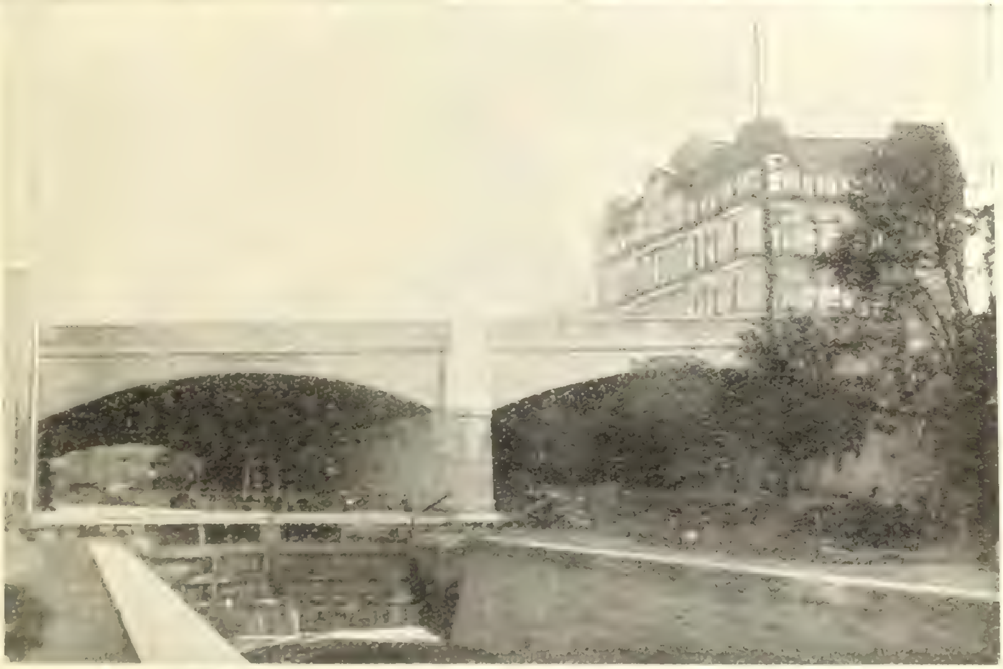

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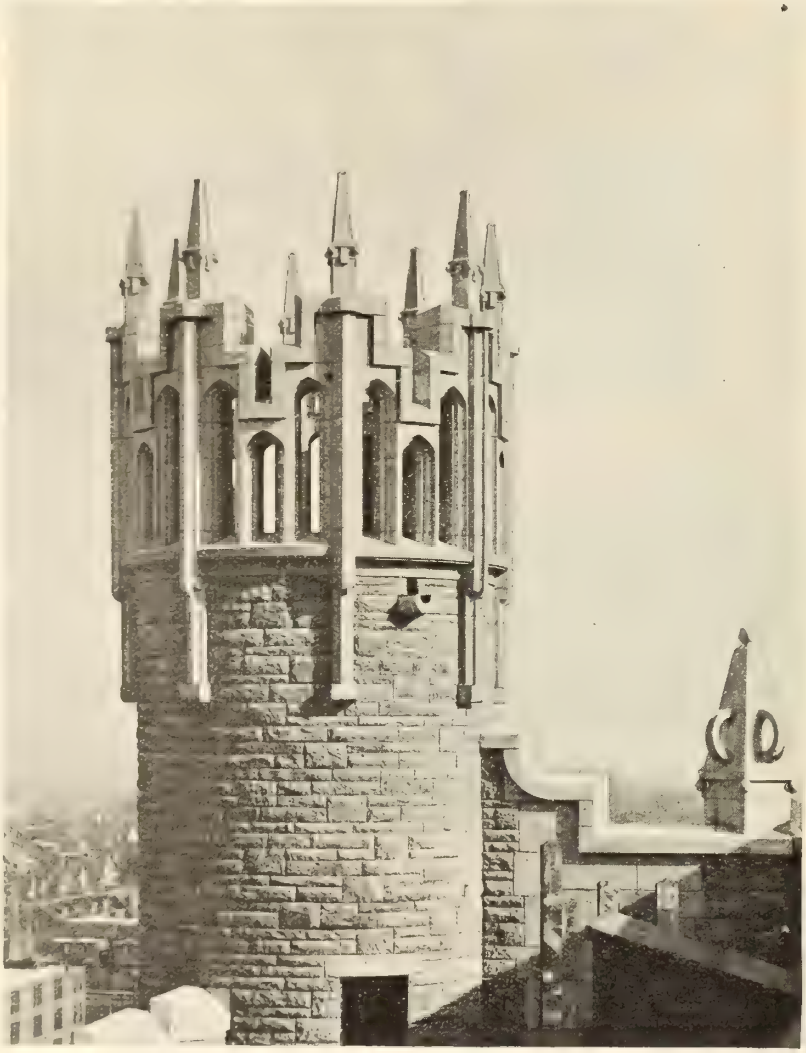

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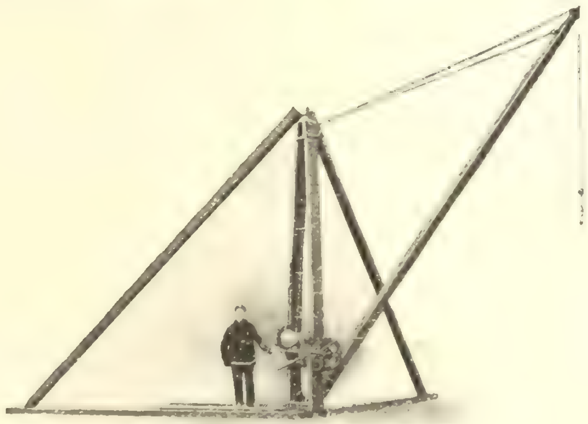

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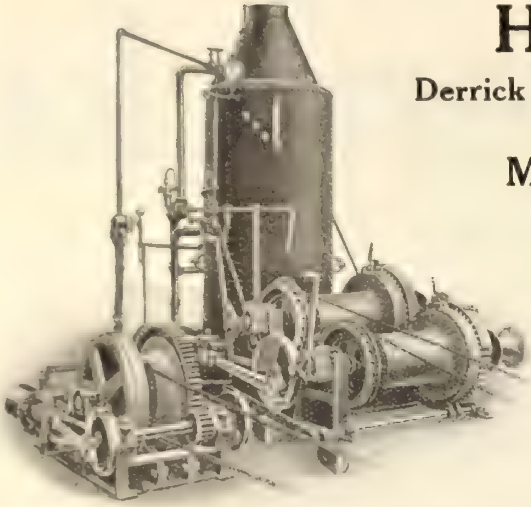

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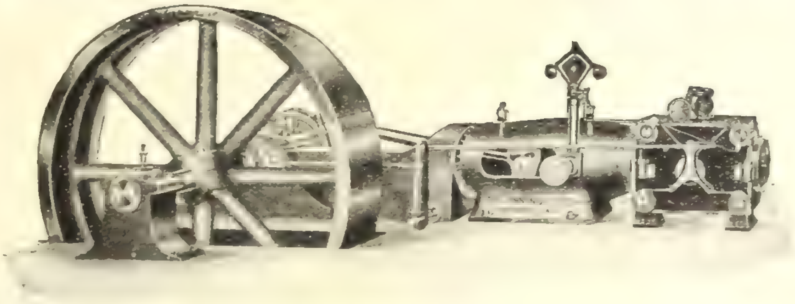

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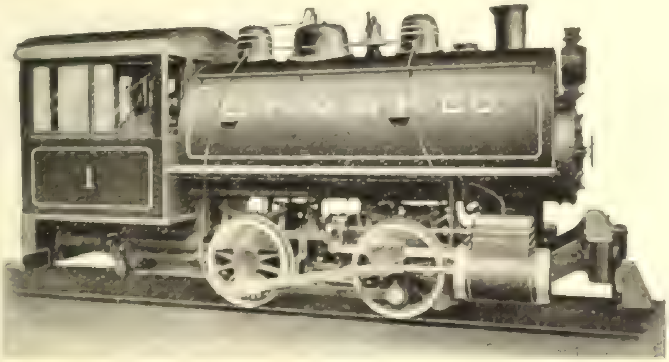

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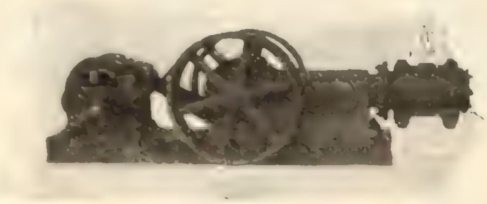

Class "N E-1" Compressor with Motor and Short Belt Drive.

SMALL HIGH SPEED COMPRESSORS

What was formerly thought to be an excessively high speed for compressors has become standard practice in the INGERSOLL-RAND Class "N" Single and Two-Stage Steam and Belt-Driven Design.

They are not simply run at a higher R. P. M. and styled high speed compressors, but are built for speed from the foundation up—heavy and rugged construction, large bearing surfaces, free and plentiful lubricating system, large valve and port areas and thorough cooling.

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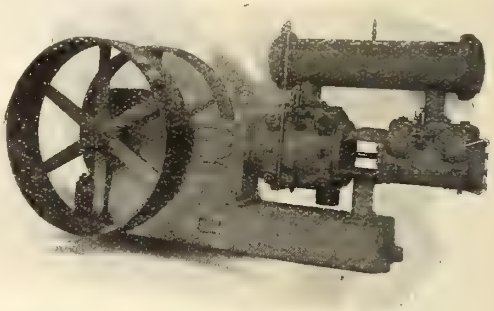
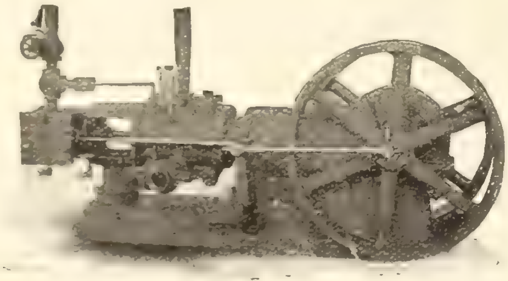


Class "N E-2," Two Stage, Belt Driven Compressor.



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The "NF-1" and "NF-2" styles are convertible from steam to belt drive and vice versa. This is in itself a most important point as there are times when steam is more desirable and profitable to use than electricity. Where a steam shovel or hoisting engine is in use a steam drive for the compressor would of course be the most feasible means of operation

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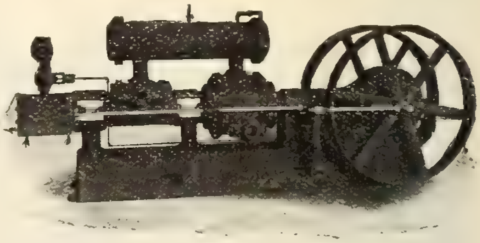
The "NE-1" with Motor and Short Belt Drive Attachment, shown in the upper left hand corner, gives an idea of the small amount of space a complete air compressor outfit takes up.

The compressor photographed is mounted on skids for easy transportation.



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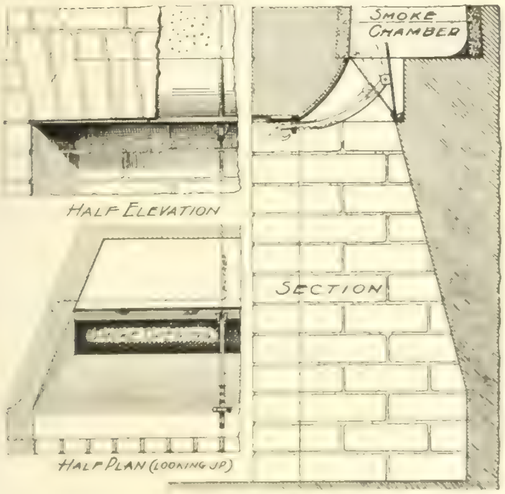

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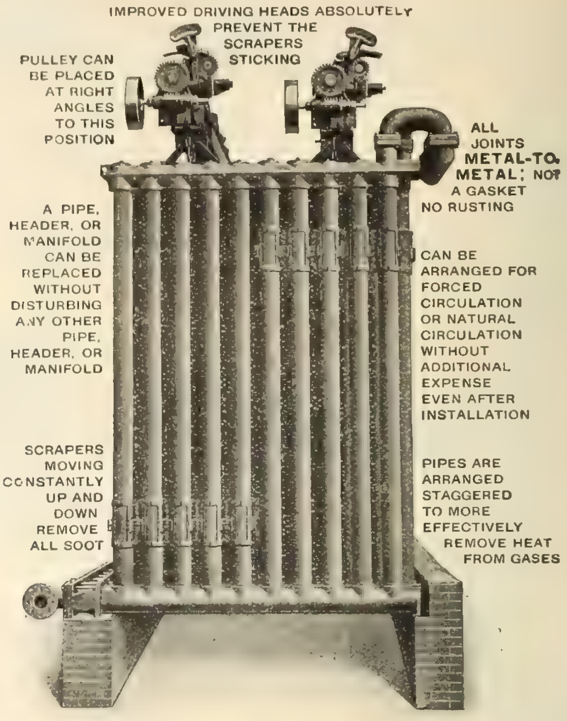
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laid in the diagonal or French style, finished with our regular Ridge Roll.

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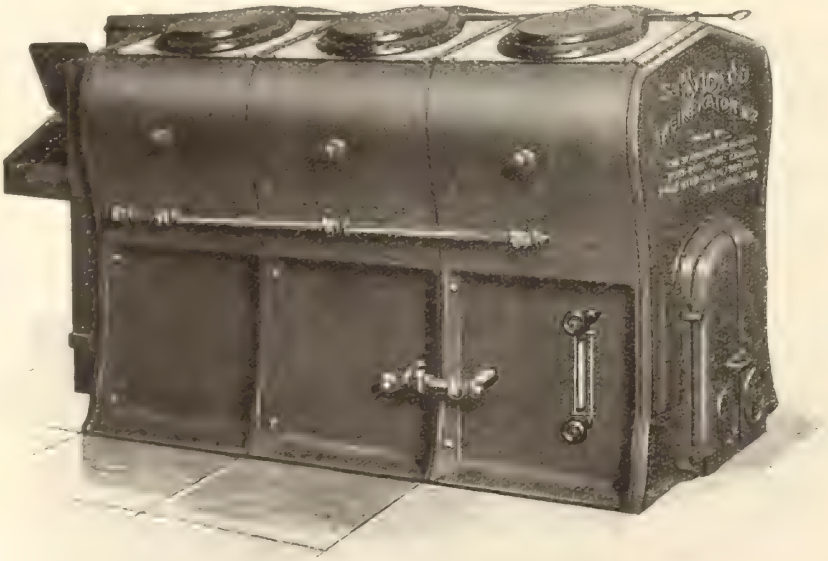

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Western Canada Slow to Profit

ACCORDING to information received from one of our western offices, the city council of New Westminster are contemplating the abolition of the contract system. The reason adduced is that the council are persuaded that the substitution of the day labor system will eliminate the contractor's profit and that such profit can be applied towards the purchase of civic plant. It is argued that a larger number of citizens will find employment than heretofore. We are told—with the delightful naivete with which statements of serious portent are often made—that the city is impressed with the economic possibilities of the plan. The intimation continues that while the day labor plan will entail the purchase of plant it is not the intention of the city to incur any large initial expense. There will only be a small outlay at the beginning.

It is difficult to believe that in a year so far advanced as 1913 a live western city can seriously contemplate entering the contract business in a small way --with the stinted equipment available from a careful outlay—and hope to save money by it. We would refer New Westminster to the investigation made a few years ago by the Boston Finance Commission. This throws considerable light upon the relative efficiency and economy of the contract and day labor systems. An effort was made in this investigation to ascertain as nearly as possible the actual figures, thus eliminating opinions. Without entering into the report extensively, it having already been featured in the columns of this journal, we will quote as a single instance the cost of sewer construction, which was shown to be 35 per cent. greater by day labor than by contract. The investigators, in a comparison of the work done by both methods in the city of Boston, expressed the opinion that had the work done by day labor been carried out by advertised contract the reduction in the cost of labor would have amounted to over 62 per cent.

An investigation carried out on such thorough lines effectively disposes of such arguments as "saving the contractor's profits," "better work," "avoidance of law suits," "employment of local labor," "adaptability to changes in plans," etc., that the advocates of day labor advance. It is not difficult to knock the bottom out of any of these arguments, e.g., the alleged adaptability of the engineer's forces to changes in plans. Is it not reasonable to suppose that the more careful preliminary study that the engineer will have to make of the work when he knows that contracts are to be awarded and that subsequent changes will increase the cost of production, will lead to an ultimate saving in cost and greater efficiency? Is not the flexibility in respect of the day labor system an encouragement of hasty and careless preliminary study?

One of the strongest arguments against the system of day labor is the low average efficiency of the men hired by the departments. It is part of a contractor's business to pick out the best men and he invariably does so, paying them a little more than the city, and getting far more and far better work out of them than the city can hope to do. The contractor pays the best men good wages while they are working for him, and during this period only. He allows his men the minimum holidays and does not carry on his working force out of sentiment or through any influence brought to bear upon him. Can the city say the same?

An equally forcible point against day labor is that it excludes competition. Other arguments are that the city officials have not the business training or the practical experience of the contractor and that their main incentive is to make a good showing and hold their jobs.

The inability of a city to make a success of contract work is a poor advertisement for its administration. The greatest constructional enterprises that have been carried out in the Dominion of Canada are a monument to the ability and integrity of our leading contracting firms and in most cases they have been carried out at a cost which compared with day labor would reduce that system to an economic absurdity.

Efficiency of Labor a Difficult Problem for the Contractor

SO much has been written in the past few years regarding the efficiency of labor in industrial establishments that one is inclined to question whether contractors have given the subject adequate consideration, says The Engineering Record. Very little has been published as to the efforts of contractors along this line, though technical literature and the advertising pages of engineering journals show conclusively that the builders of public works and large structures are fully awake to the development of more efficient equipment. The labor-efficiency problem, nevertheless, is giving serious concern to contractors, and if nothing spectacular has been accomplished it is due to the almost hopeless limitations of the problem.

Fundamentally, of course, the problem of increasing the efficiency of common laborers engaged on large works is very much more difficult than that of increasing the efficiency of men in industrial plants. The former are in general not closely supervised, perform [illegible] is not so easily standardized and frequently are employed on operations only occasionally repeated. In industries, however, the work is under close supervision, the operations are oft repeated and can be more easily analyzed and standardized. While, therefore, the efficiency of industrial workers may be raised to an average of, say, 90 per cent., it is not likely with the same effort and expenditure for supervision that common labor on contracts will be brought to an efficiency of 70 per cent.

The first factor in the contractor's labor problem is the chronic shortage of good men, which has led successful contractors into spending money which will reduce the number of men needed even though the work may not be performed more cheaply. The fewer men required, the less will be the already heavy burden of keeping a full crew.

When, then, the problem of improving the efficiency of such labor as is secured is faced, conditions decidedly different than those which obtained fifteen years ago are encountered. The common labor then was largely from the north of Europe—Irishmen, Germans and Swedes. These men were efficient, industrious, capable of being taught and more or less ambitious. With men of this class training in efficient methods would have been comparatively simple. But to-day the men of these nationalities left in the ranks of the common laborer are largely "hoboes"—men who because of drink or other reasons have failed. The remainder of the present available labor is from the south of Europe—Italians, Greeks, Hungarians, Roumanians and Bulgarians, who do not understand English and are without the ability or desire to learn anything but the simplest operations. The result is that the efficiency per man is very much lower now than it was ten years ago, despite the fact that the wages per man have materially increased.

Moreover, on account of the scarcity of common labor during the past few years and the high wages paid, laborers on construction work are generally of the "short-stake" class; they work long enough to get money to go on a carouse. Then, too, the laborer knows that he can quit at any time and get another job just as good as the one he has, with the result that ambition is stifled, men become careless and do not care whether they are discharged or not.

With these conditions facing the contractor it is practically impossible for him to select his men; he must take those that offer and the training in efficient methods of even his constantly changing English-speaking crew is almost impossible. The foreign labor is hopeless as to training along these lines. It is likely, therefore, that until conditions change radically for the better (and how that change might come is not now apparent) no marked increase in efficiency of construction labor can be expected.

The Utilitarian and the Artistic in Engineering Structures

By G. R. G. Conway, Vancouver, B.C.

WITH all our progress, proud though we may be, is it not well to remember that because the work of the engineer forms a vital and integral part of the life of any community we should all pay some regard to the creation of beauty and the influence of engineering upon the minds of the people?

In olden days engineering and architecture were practised by the same individuals. The old Roman engineers, designers of the Pont-du-Gard and the Claudian aqueduct, produced great engineering works that are among the finest architectural remains of that great race. In the renaissance period were not the great artists Michael Angelo, Leonardo da Vinci and Palladio great both in architecture and engineering? Modern engineering, though, with all its mighty achievements, is still in the early pioneer stage, while the traditions of architecture are hoary with the experience of ages.

Engineering structures in steel have been accused of being purely utilitarian, and even William Morris denounced the famous and, as many of us think, beautiful Forth Bridge as "that supreme specimen of all ugliness." But Morris did not understand as the designers did that their "object had been to arrange the leading lines of the structure so as to convey an idea of strength and stability," and that object they had considered the highest art. On the other hand, a famous artist—Alfred Waterhouse—writing to Sir John Fowler after the bridge was completed, said: "The simple directness of purpose with which it does its work is splendid, and invests your vast monument with a kind of beauty of its own, differing though it certainly does from all other beautiful things I have ever seen."

We cannot yet expect that a well-designed steel structure will be properly appreciated as stone structures have been. The Parthenon was built during the time of Pericles, when Greek art and literature reached their proudest zenith; but that great period was preceded by centuries of strenuous effort and experience. Steel structures belong but to yesterday, and many new and more perfect types remain to be evolved in the future. It is, therefore, unfair to apply the same standards of criticism to a modern steel structure as would be applied to one of wood, brick or stone.

The evolutionary process that is apparent in the design of modern steel structures, to use Herbert Spencer's line of progress in organic evolution, is from "simplicity to complexity, of structure, and from obscure complexity to a defined simplicity of function." This "simplicity of function" should be the prevailing note in all well-designed structures to-day. Michael Angelo maintained that an architect should have a knowledge of anatomy. Cannot we also boldly assert that to those who examine iron and steel structures from an aesthetic point of view a knowledge of their anatomy and of the functions of their various parts is essential?

It is essential to-day that there should be greater co-operation between engineers and architects. To-day I think we can point to many fine engineering works on the American continent and in Europe that have a magnificent and beautiful appearance. There is great scope in the building of masonry and concrete dams, and this has been well carried out in the Croton dam for the water supply of New York, and in the dams for the supply of water to the cities of Liverpool and Birmingham. We see the co-operation of engineers, sculptors and architects in such beautiful bridges as the Pont Alexandre in Paris and in the great terminal railway stations of the Pennsylvania Railroad, the New York Central, the terminal at Washington, and the Orleans station at Paris; in power houses, Niagara and elsewhere, and in the general progress of town planning; and I might also further point out the possibility of beautiful designs in reinforced-concrete structures is being thoroughly appreciated.

Why should not even the humblest railway station be a beautiful object? We no longer believe in Ruskin's fierce denunciation of architectural railway stations; and in these days of constant travel the comfort and beauty of a railway terminal are a delight to traveling men. Why cannot we have beautiful designs for the buildings and chimneys of a steam power plant, for a water tower, for all our bridges, for service reservoirs and valve houses? We should, though, in every case let these structures express by their design their meaning, stating plainly without pretension what they represent. We do not want a railway terminal to look like a temple for the worship of Minerva or a steam plant chimney to resemble Cleopatra's needle.

Engineering touches every phase of our life, and it is clearly our duty to do all we can, not only to assist the material prosperity of our country, our state or province, but to contribute to all those things that elevate man outside of the strenuous everyday struggle for existence into a sphere that will enable him to appreciate the higher arts, and in that work the engineer can do his share in proving that the useful can also be beautiful.

Crop Outlook Satisfactory

REPORTS received in Winnipeg from over two hundred points in the Canadian West say that seeding is well on the way to general completion. At 114 points over 75 per cent. of the wheat area is reported seeded. Taking into account the acreage of surrounding points, which report a less amount seeded, it is reasonably safe to assume that fully 73 per cent. of the land intended for wheat this year has already been sown to that cereal. Fifty-five points report the acreage seeded to be just about the same as in 1912; 35 points reported the acreage as less than that of 1912, while 44 points report an increase of acreage running from 5 per cent. to as high as 25 per cent., though this last figure occurred but seldom, thus indicating that there probably is no increase in wheat acreage this year, and possibly a fractional decrease.

The reports, almost en masse, declare that, while the season is, on the whole, considerably later than in 1912, owing to the condition of the ground, seeding is actually in advance of what it was on the corresponding date of last year, and with a better general outlook for the season.

Taken as a whole, the report is a very satisfactory one. The fact that the acreage of wheat is not being materially increased is really a very healthy and satisfactory sign, as it shows that the farmers are slowly but surely awakening to the danger of seeding wheat late, and have confined themselves largely to land that was prepared last year.

Good Roads in Saskatchewan

THE improvement and maintenance of good roads in the rural districts is a vital problem in all parts of Canada. Inevitably, perhaps, the phenomenal development of railway and waterway navigation has largely overshadowed the necessity that exists for properly built waggon roads. However, it is steadily being more fully realized that the absence of such roads causes an economic loss of great importance to every citizen, and especially those of the rural districts.

Saskatchewan has appropriated $1,200,000 for highway improvement work during 1913. This is merely a continuation of the work commenced in 1905, and each year since then the government has expended from $200,000 to $700,000 a year on roads and bridges. The work has been carried out under the supervision of a board of highway commissioners, and assistance is confined to the building of bridges and trunk roads.

In view of the scarcity of gravel and stone in many parts of Saskatchewan, extensive experiments have been carried out at provincial expense to ascertain the best means of constructing clay roads. It has been found that Saskatchewan clays burned at comparatively low temperatures produce an excellent surfacing material for graded roads. Owing to the reddish colour of this burned clay these roads are known as "the red roads of Saskatchewan." Their cost, where underdrainage is not necessary, has been found to be from $2,000 to $2,500 a mile. This includes the cost of burning the surface clay. Where tile drainage of the grade is essential, the cost is increased by from $1,000 to $1,500 a mile. It is claimed that these roads stand up well under prairie conditions.

Another class of road that is being experimented with in Saskatchewan consists of a specially prepared clay grade covered with asphalt. If suitable to the conditions, such a road should prove popular in the smaller towns and villages.

Electrolysis and Sewage Purification

Electrolysis as an aid to sewage purification is a rather recent development and much more is to be expected from it. Oklahoma City has installed a plant where this treatment is successfully applied. A slow stream of city sewage is run through flumes between batteries of iron electrodes. A current of 270 amperes and 2.5 volts is passing between the electrodes and, of course, produces considerable electrolysis of the salts contained in sewage. The result of such electrolysis is to liberate a great deal of oxygen and some ozone at the anodes. This active oxygen and ozone oxidizes the organic matter into harmless and unobjectionable products. At the cathode some metallic hydroxides or bases are formed and these assist in coagulating the floating filth. Colloidal particles in fine suspension are also driven to the electrodes and collected in masses large enough to settle. This Oklahoma plant has a capacity of 750,000 gallons every twenty-four hours at a cost of operation of only $2.16. The municipality is now building a plant for the electrolytic formation of a flocculent precipitate, capable of treating [illegible] gallons daily.

Shavings, when used in conjunction with coal as a boiler fuel, have a heating value of from 45 to 50 per cent. of an equal weight of coal.

Principles of Scientific City Planning

Streets and Transportation—Water Supply and Sanitation—Problems Identified with Factories, Housing, Architecture and Financing

By Geo. B. Ford, New York City.

CITY planning is rapidly becoming as definite a science as pure engineering. The best plans for the development of a city can be determined upon in advance as clearly as can the plans for a bridge or for a reservoir. It is solely a matter of proceeding logically from the knowns to the unknowns. In city planning there is above all the necessity for a careful analysis of the conditions. The requirements must be first definitely determined upon. Then these should be separated into several classes, according to their urgency, ranging from the immediate and the imperative through the desirable to the more remotely advantageous. Working in this way one soon discovers that in almost every case there is one and only one logical and convincing solution of the problems involved.

From recent experience in city planning, I am fully convinced that the sort of facts we want to hunt for and the method of bringing down our game can actually be standardized and it is one of my minor ambitions to change this hitherto rather capricious procedure into that highly respectable thing known as an exact science.

Before elaborating my point let me sound a note of warning since in certain cities science in city planning has been decidedly overdone. The reaction from the "City Beautiful" has swung the pendulum too far the other way and the work has been put entirely in the charge of engineers who, while they have achieved excellent results from a scientific standpoint have failed to appreciate the vital importance of the social and aesthetic sides of the problem. In doing so they have attained results fully as unfortunate in their way as have those city planners who have approached the subject only from the standpoint of the city beautiful.

The Work of Several Experts

It is becoming more and more obvious that the best way to secure a city plan which will be lastingly satisfactory from all points of view and really comprehensive, is to put the work in charge of several experts, one an engineer, one an architect, and one, perhaps, a social expert. It is practically a physical impossibility for one man, in one lifetime, to acquire an adequate and impartial appreciation of all these points of view. Realizing their limitations they should be sufficiently broad-minded to seek first aid from specialists in landscape architecture, housing, recreation, transit, etc. This group of experts must work together from the start and consult continually with regard to each feature and phase of the city plan.

By such co-operation and by the standardized procedure of which I am about to give you a rough outline, it is possible to determine within a comparatively short time a plan which is not only the best for today, but which is so elastic that any changes during the next fifty or a hundred years can be fitted into it with virtually no loss or alteration.

In emphasizing the scientific side of city planning I do not wish to administer a snub to the aesthetic side. Both phases are necessary to the complete city. The problems of convenience, of health, and of efficiency are matters of science, while the things which foster our own delight in the city and which impress the stranger within our gates, comes within the range of the aesthetic. The development of both should go on side by side, the practical a little in advance because it most nearly affects our life and well-being. The aesthetic to stand the test of time must follow the lines laid down by the practical interests of the community. Psychologically it is quite justifiable that American city planning began with the "City Beautiful." The "City Scientific" would never have aroused such enthusiasm. However, after floundering around for a number of years we have now got our perspective and a sense of the proportion of things, and we know that considerations of health, convenience and efficiency are of fundamental importance.

In the science of city planning the whole city is our laboratory. All its facts and symptoms are more or less under observation but the expert city planner soon sifts the significant from the less important.

Experience has shown to the expert that the significant facts must be collected under the following heads:

Streets.
Transportation of people.
Transportation of goods.
Factories and warehouses.
Food supply; markets.
Water supply and sanitation.
Housing.
Recreation.
Parks, boulevards, street planting.
Architecture.
Laws.
Financing—Methods of paying for improvements.

All of these, of course, are capable of infinite subdivision.

Within the space allotted to this paper it is manifestly impossible to go into detail but we will take a few typical subjects to illustrate the scientific method which applies to all.

Street Widening and Extension

In any given city, before we begin to gather our data it is imperative to have clearly in mind the various types of street use. Streets are used by pedestrians, either moving along the sidewalks or crossing the roadways. The roadways are used by light horse-drawn vehicles, heavy horse-drawn trucks, light, swift-moving automobiles, heavy, slower moving automobile trucks, by bicycles and push carts—which are in most cases, hardly important enough to count—by street cars, and, in some instances, by motor busses.

We must further determine what is the ideal street arrangement on street cross-section for each of these types under various conditions. Highway engineers are pretty well agreed upon such types. We have our units of sidewalk width of 2 ft. per person, we have our units of roadway width of 8 ft. per vehicle, and we know that for so many slow moving vehicles, passing a given point in a street per hour we need so many units of width in order to prevent congestion and that so many swift moving vehicles demand so many units, that so many heavy trucks demand so many units, and that the varying combinations of these, demand a certain definite number of units of width in the street. We know that wherever possible it is desirable to segregate the different types of traffic, and put the swift moving automobiles on a street by themselves, and the slow heavy trucking on another street by itself and the street cars and ordinary vehicles on still a third street, but where we cannot realize this ideal the more nearly we can approximate it the better.

We are now in a position to gather our data for the particular case with some knowledge of what we are doing and why.

The first tool we need is a set of complete up-to-date surveys and maps of all existing and proposed streets, together with their cross-sections and surfacing. We must have, also, contour maps if possible, models so we can visualize grades.

The next tool we need is a set of historical maps of the city made at periods from 10 to 25 years apart. These will give us a basis for determining the tendencies of growth of the city.

We should have made further maps showing the distribution of people both as to where they live and as to where they work. Also charts showing how people leave and enter the city by street cars or by trains. Also how goods and freight are handled and where.

Next, after this general data it is necessary for us to know the existing use of the streets at all of the critical points in the city, both at street juncture and in the centres of important blocks. Traffic counts should be taken simultaneously by one tabulator to each item of all the different kinds of traffic passing the given point. The pedestrian traffic in each direction on each sidewalk, the light horse-drawn traffic in either direction, the heavy trucking in either direction, the swift-moving automobile traffic in either direction and the street car traffic in either direction. On corners this becomes multiplied several times so that on important corners it has been found necessary to have as many as 32 men at once in order to tabulate simultaneously a correct count of the traffic passing these points. Furthermore, this tabulating should be done on various typical days under different weather and temperature conditions and also on some day of exceptional stress when the movement of large crowds taxes the street to the utmost. The data secured at all these strategic points should be tabulated under appropriate headings and arranged for immediate comparative reference.

By comparing these figures, at any given critical point with the standards and ideals as to street use, we can see, at a glance, whether or not, this street at this point is doing its work efficiently, whether it is over or under-burdened. If a given street is working under capacity and a neighboring street is over-taxed, we can study means of diverting some of the traffic from the second street on to the first, either by traffic regulations or by cutting through a diverting channel. As to whether cutting through this diverting channel is good economy or not is a question which we will discuss later.

In case a given street is over-taxed and there is no parallel street through which traffic can be readily diverted then we can study the comparative advantage of widening the existing street or of cutting through a new street to take part of the traffic. In the first place, we should bear in mind that in widening a street there is always a point beyond which a street becomes too wide to be efficient because the two sides are so widely separated that people hesitate to cross the roadway. Then we must consider carefully the cost of widening the street, including all details and see if the gain through avoiding congestion of traffic and the gain to business on either side of the street will warrant such widening. To be more explicit counts should be taken with a view to determining the loss of time to pedestrians and to the various forms of traffic due to congestion and blocks caused by the narrowness of the street. This loss of time multiplied by the money value of the time of the people involved and by the time interest on the capital tied up in vehicles and their loads, will give us a definite figure. The aggregate of these figures for the year will sometimes reach amazing totals. If we then consider what capital on a 5 per cent. basis this yearly waste represents, anyone can judge for himself whether the saving to the citizens warrants the cost of the improvement. If the cost of widening the street proves to be unwarranted the next problem is to see whether the traffic can be diverted through parallel side streets and if these are not wide enough whether they can be widened to good advantage. If these do not work out, then we should consider the desirability of cutting through new streets or extending existing streets in the neighborhood parallel to the congested street. The same method of testing the desirability of these solutions can be applied in each of these cases.

Analysis of Traffic

Every critical street corner must be analyzed to see where traffic goes, what proportion crosses and what proportion turns the corners. If a large percentage turns a given corner it is obvious that a cross connection between these streets would relieve that corner. The desirability and value of such a cross relief can be determined in the same scientific manner as street widening.

The same principles apply to streets in all parts of the city, and by considering each over-taxed and each under-used street in relation to others in its neighborhood it is possible to determine the one best solution for the case in hand, whether it be the widening or the extension of existing streets, or the cutting through of new streets.

Of course, we must bear in mind, in any given instance, that our best laid plans may be interfered with by some political or local prejudice and probably a certain amount of compromise will be necessary in order to get results.

Now all of this development of our plans is purely scientific and the best way of doing it can be as well determined now as through a process of sitting over a long period of years. The aesthetic enters in only to a slight degree. In a case where slight shift in the axis of a new street or the widening of an old street on one side instead of the other, would give us a vista of some impressive building due cognizance should be taken of this provided it does not call for an unwarranted increase in the cost of improvement and does not otherwise invalidate the practical reasons for the original solution.

The same general principles apply in the case of transit, transportation and sanitation, as in the case of street widening. The same scientific investigation, analysis and deduction and the same definiteness in determining the best solution of the problem is now possible and feasible. If others have failed to solve these problems it is because they have not gone at it in this scientific manner.

Housing

Housing can be roughly divided into two main divisions, i.e., improvement of housing in already built up sections, and the providing for housing in new sections. In either case, experience has developed working standards as to sanitation, lighting, air and convenience, and given us the minimum to go below which is criminal.

The obvious first step in any given city is to make a survey of existing conditions. It is important to have maps showing the distribution of the population locating at a glance the congested districts. Other maps showing the location of each kind of habitation with the increase of that type during each of a number of previous years, will determine the tendency of growth both as to direction and as to kind of dwelling. Then a number of typical blocks including in particular some of the worst, should be investigated with an intensive survey to discover the amount, character and location of housing conditions which fall below our minimum standards.

If, with regard to already built up areas, a proposed street improvement can be carried through a slum area without otherwise invalidating its usefulness, it will be of great advantage in the cleaning up of that area.

In the case of congested transit and traffic conditions in the centre of the city, the determination of the best way of housing people in suburban areas and the relative distribution of such people with a view to their number per acre in any given district will have a marked influence on the relief of such congestion. Furthermore, the creation of desirable housing areas on the outskirts will tend to pull people away from the congested districts and these would be accordingly converted into commercial districts with a corresponding effect on the desirable width of streets and sidewalks in these parts of the town.

When it comes to the planning of new areas the whole problem can be worked out as scientifically as in the case of street widening and extension. Investigation will show just how many people can afford to spend a maximum of $10 a month for rent, how many $15 per month, how many $20, etc. It will show where they work and how far they ought to live from their work for the maximum efficiency.

Investigation will also show the cost of land throughout the city and the relative desirability of different sorts of land for housing use. With these figures of cost of land, of the number of workers for a given wage and with figures as to place of work all plotted on the maps of the city, we can determine accurately what type of streets, what type of lot and block unit and what type of house should be built in a given locality in order to be best suited to the needs and means of the normal inhabitant of that locality. For example, on the highest priced land near the factories, it is possible that tenements are the only economical solution. On land a little further away it is possible that houses in rows are the best solution. On other property the single house or the two family house will be the best solution, according to the habits and demands of the community. For each of these types of house experience has standardized the types of streets, blocks and lot units, which from all points of view give the best results. In the case of the tenement it consists of many not too wide streets, running north and south with the tenements in rows only two rooms deep, with north and south open spaces between them. In the case of the house in rows it consists of a corresponding north and south arrangement with lots more or less on the Philadelphia type. In the case of the two-family or one-family houses, it consists of an arrangement of plots from 50 to 75 feet deep and from 30 to 40 feet wide with such variety in direction and line of streets as aesthetic consideration may dictate. In each of these cases, however, the problem as to the width of roadways, sidewalks, grass plots, etc., must be worked out with a view both to present lot cost and to future convertibility when the character of the neighborhood may change.

The best type of plan of street block and lot units for any part of the city, can, by this program, be scientifically determined, all with a view to giving the maximum advantage from a housing standpoint. The whole could be done with scientific accuracy except for the variations due to the possibilities of different treatments from an aesthetic standpoint. In suburban areas, particularly in the cases of the one and two family houses, there is an infinite variety of artistic schemes possible, all with very little loss of efficiency.

When we come to recreation we find the problems are similar to those of housing and that they can be solved in the same definite way according to scientific methods.

Laws and Financing

Even the laws, financing and administation have all been standardized. The Bureau of Municipal Research in New York has, from the experience of cities all over the country worked out definite methods of handling these to secure the greatest efficiency with the minimum cost.

Architecture

Architecture is a most important side of city planning. It has to do with the designing, grouping and setting of public buildings, the designing of bridges and quays and other water front improvements, the designing and location of public monuments, such as arches, columns, obelisks, fountains, exedras, statuary, etc., and with all street and park features such as subway and elevated stations, public comfort stations, waiting stations, advertising and other kiosks, lighting, telegraph and telephone poles, lighting fixtures, fire alarm and mail boxes, hydrants, water troughs, street names, water towers and gas tanks, and all temporary street architecture for parade or pageantry use. In the same connection we should consider landscape architecture.

In each of these cases, experience has become standardized to the extent of having a best arrangement for use and a most economical construction. Otherwise, in contradistinction to all the previously discussed phases of city planning, architecture and landscape architecture are much more matters of aesthetics than of science. As in the artistic field so much depends on inspiration that the happiest solution of any given problem can never be counted on from any one designer at any given time. For that reason a competition among a limited number of the best designers is often warranted. However, before throwing these matters open to competition all the facts should be very carefully collected, arranged and presented in a clear and definite form to the competitors. In short, in our city planning work we have not made enough distinction between these two main phases of city planning: the aesthetic and the scientific.

In conclusion I would say that a great deal of our disagreement as to the method of attack and the relative importance of the various problems in connection with city development has resulted from a failure to recognize that we were often arguing about entirely different matters or from an entire different point of view. One man has been discussing the problem from the aesthetic side. Now, it is quite feasible for us to get together and understand each other, provided we recognize that there are these two points of view, and provided we can agree upon a dividing line between these two phases.

Stopping Planes in Reinforced Concrete

It appears to the writer, from considerable experience of reinforced concrete construction, that insufficient consideration is as a rule given to the determination of positions of stopping planes in this class of work.

Beams and Slabs—In concreting beam and slab work, it is a common practice to fill up the beam forms to the level of the under side of the slab; then, at a later stage of the work, to follow over with the slab concreting separately. During the interval, the surface of exposed concrete receives more or less injury from dirt, etc., and it has frequently been noticed that the shear reinforcement gets flattened down and knocked out of shape. These circumstances result in a plane of weakness as regards horizontal shearing on the line a—b in Fig. 1. It has further been observed that the stopping planes in the slab concreting are often made vertically over the longitudinal center lines of beams, as at c—d in Fig. 1.

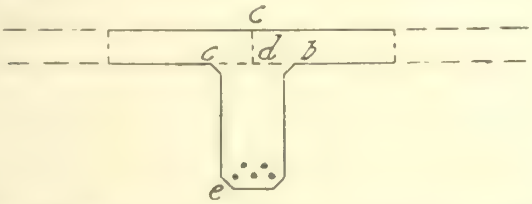


Fig. 1. -Plane over beam center, resulting in probable weakness in slab.

In this type of design the beams are in general calculated as T-beams; and, nothwithstanding the fact that many successful contracts have been carried out in the manner indicated, it is submitted that it is undesirable to make temporary joints in the position shown. No matter how carefully the surfaces are cleaned and roughened, the homogeneity so greatly desired cannot be secured.

To obtain the full value of the area of concrete in compression—i.e., that portion of the beam proper which lies above the neutral axis, together with the width of the slab acting with it—stopping planes should be excluded, as far as practicable, from that area. Unless the vertical reinforcements in the beams maintain their intended shapes and positions, are rigidly attached to the tensile reinforcement, and well concreted into the compression area, the resulting construction approaches that of a rectangular beam of depth a—e with the slab resting upon it, and the strength will be considerably less than the designer intended.

As a matter of practical construction, stopping planes must occur somewhere in the concrete; and it is suggested that in the case of beams in one direction only—i.e., no secondary beams—the better practice is to cast the beam and slab in one operation as shown in Fig. 2, in which the dotted lines f—g and h—j represent joint lines parallel with the beams and at the centers of the slabs between them. There can be no serious objection to the joint through the slab, as it is at right angles to the direction of the main reinforcement, the bars of which, being continuous over two or more beams, ensure full tensile strength being available. A temporary face-board would be necessary to keep a vertical face of concrete to join up against on resuming. The upper part of the slab being in compression, the action under loading will be simply pressure on the two concrete faces, and the shearing stress at the joint will be nil.

In constructing larger floors where there are both main and secondary beams, a somewhat similar method is desirable. For the purpose of illustration, a floor has been assumed as in Fig. 3, where the main beams, supported at intervals by columns, run the short way of the building; and between the main beams are the secondary beams, with a slab over all.

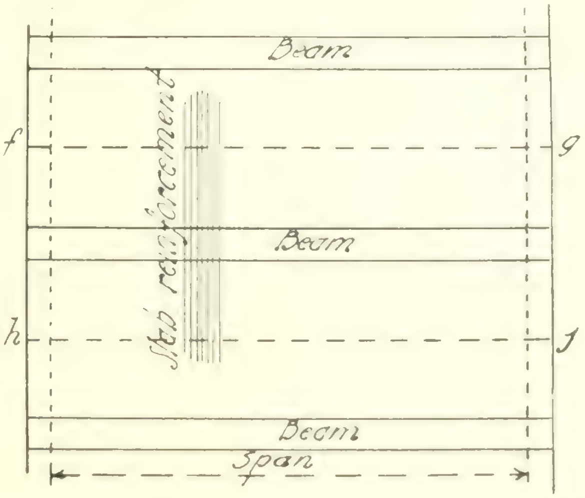


Fig. 2.—Beams running in one direction only—beams and slabs cast as units—planes midway between beams.

Here the main beams and column connections demand special notice, and from theoretical considerations the concreting would be most advantageously carried out in bays across the short way of the building, each bay comprising a main beam and portions of the attached secondary beams and slabs, the joint lines being along the center lines of slabs and parallel to the main beams, as shown by the broken lines a—a. Complete homogeneity would thus be asured to the main beams and the portions of the slab acting therewith as a T-beam; there would be no break in the work or around the column heads; and so far as the secondary beams are concerned, the stopping planes would be in the most suitable positions—viz., at the center of the span and at right angles to the direction of the beam.

Assuming, however, that the size of the building is such that the volume of concrete in one bay, as indicated, is too great to be put in without a break, it will be necessary, in order to reduce the amount of work to be done in one operation, to make stopping planes through the main beams. The first point then calling for notice is the necessity for avoiding a break at the points of inflexation (which are at approximately a dis-

By [illegible] Stead in Concrete and Constructional Engineering tance of one-fourth the span from the supports), on account of the shearing action at such points. A stopping plane could most advantageously be made at the center of the middle span—i.e., in the line b—b.

In no case should concreting be stopped in beams or slabs where shearing stress is likely to be great, as at a point near the supports or under a heavy concentrated load.

It is necessary to fix the whole of the reinforcement in beams before concreting is commenced; but in the case of slabs a common practice is to lay the bars down a few at a time as the concreting proceeds. The adoption of the stopping planes advocated above necessitates the fixing of the slab bars in advance of the concreting—a decided gain as regards accuracy of spacing and the ultimate strength of the work.

Columns—In general, stopping planes in columns present no difficulty, as they are usually concreted for the full height between floors at one operation. Even if this does not occur, provided the concrete is temporarily left with the horizontal surface, and kept clean and free from foreign matter, no weakness is incurred, as the joint will be at right angles to the pressure upon it.

Arches—The stopping planes in concreting arches may occur, according to the magnitude of the arch, either longitudinally or transversely. In each case, both the upper and lower reinforcements should be placed and fixed securely in position prior to commencing concreting. Where possible, a strip the full thickness of the arch should be concreted from abutment to abutment in one operation, the temporary joint being made against a profile erected on the laggings, in the case of longitudinal reinforcement only, or, in the case of mesh reinforcement, by short boards set vertically between the meshes, as shown in Fig. 4.

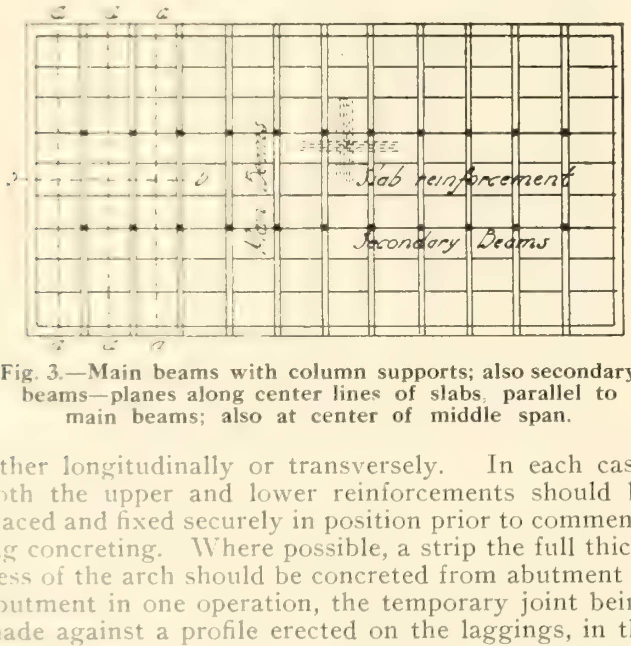


Fig. 3.—Main beams with column supports; also secondary beams—planes along center lines of slabs, parallel to main beams; also at center of middle span.

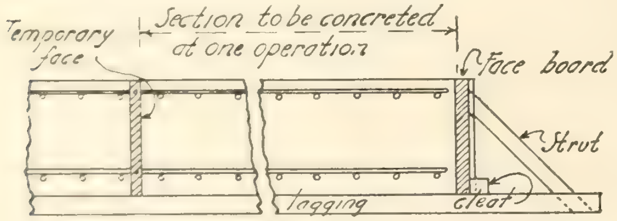


Fig. 4.—Use of temporary board facing in longitudinal concreting of arch.

In concreting sections of the arch transversely, the stopping planes should be at right angles to the line of pressure, or, for all practical purposes, perpendicular to the curve of the arch at the point; and, where possible, it is preferable to concrete a section the full width of the bridge at one operation. The temporary joint in this case will be made against a straight shutter of such depth as to be a very easy fit between the upper and lower reinforcement, such shutter being slipped in from the ends and temporarily secured at the proper angle. On recommencing, the shutter will be drawn out, the face-boards fixed, and concreting proceeded with. The formation of a stopping plane of this description is shown in Fig. 5.

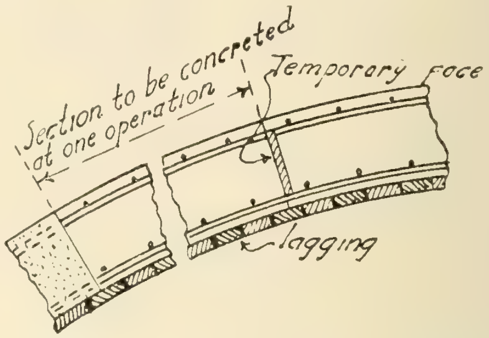


Fig. 5.—Formation of temporary joint in concreting an arch transversely.

By careful consideration beforehand, the positions of stopping planes ought to be determined and then worked to. Too much emphasis cannot be laid upon the necessity for thoroughly cleaning, roughening, and laying thick grout upon all stopping plane surfaces when concreting is recommenced.

How to Attach Plaster to Concrete

The Aberthaw Construction Company, Boston, Mass., recommend the following method of attaching plaster to concrete. "Make the concrete as porous as possible by omitting sand from the mix and by not spading the concrete next to the forms. Where plaster is required underneath a floor or roof, if the forms are sprinkled with ½-inch stone before the concrete is placed, a rough surface will be obtained to which plaster will key nicely.

To attach Portland cement plaster to smooth concrete, hack the surface with a point, brush the surface thoroughly to get the dust out, wash it, and in every case make sure that the under concrete is thoroughly wet before the plaster is applied. Otherwise the water will be soaked out of the plaster and the plaster will not adhere. Wash the surface with grout just ahead of the plaster and make sure that the plaster is applied before the grout has time to set.

It is the experience of the Aberthaw Construction Company that lime plaster is very unsatisfactory for placing on concrete surfaces. The only way they have been sure of a satisfactory result is to use plaster which is principally composed of plaster of Paris.

From the account of some experiments made by Mr. E. A. Barrier, a Boston engineer, and embodied in a report made under the direction of the Associated Factory Mutual Fire Insurance Companies, it would appear that sawdust possesses some special merits as a fire extinguisher when dealing with small outbreaks of liquid combustibles, such as lacquer and petrol, which are usually difficult to extinguish by ordinary means. Sand is generally looked upon as the best substance to use in such cases when it can be applied promptly, but the tests showed sawdust to be superior.

Surface Treatment of Concrete Work

Conclusions Reached After an Investigation by the Concrete Institute -Brush Rendering and Other Methods—Cracks in Concrete

At a recent meeting of the Concrete Institute (London, Eng.), a report of the Reinforced Concrete Practice Standing Committee, dealing with the subject of the surface treatment of concrete, was submitted by Mr. G. C. Workman, the hon. secretary of the committee.

As a result of investigations the committee have drawn the following conclusions—namely, that the most usual way of obtaining a smooth surface on concrete or reinforced concrete works consists in careful preparation of the moulds and the use of a fairly liquid mixture of concrete of such consistency as will allow of the smaller particles of the aggregate and the cement being brought towards the outer surface. Care must be taken, however, that the moulds be sufficiently watertight to prevent the formation of honeycombs at any of the joints.

A good surface may be obtained by working up and down against the shuttering with a spade perforated with holes, which treatment will bring the smaller materials towards the outer surface of the work. Another method consists in applying to the inside of the moulds a mixture of sand and cement, and then to form the core with concrete of an ordinary mixture.

The usual method of treating the surface of concrete which has hardened consists in hacking the face of the work and plastering it with a mixture of sand and cement in the proportion of 1 to 3. The surface of this plastering must be left sufficiently rough to form a key for a finishing coat of sand and cement in the proportion of 1 to 2. To obtain a perfectly level surface this coat can be finished with a steel trowel or wood float. A similar process with Keene's cement gives a very good outer coating.

It is advisable to avoid the rendering or plastering of any surface of concrete or reinforced concrete which is to be exposed to weather, because in such case the thin coating or rendering applied to the hard surface of the concrete is likely to peel off or to craze. If a smooth surface is required, it is better to obtain it by means of carefully prepared centering.

A good method of improving the appearance of the surface of concrete which is to be left from the moulds is to wash it over, after making good any deficiency, with grout composed of cement and water. This operation is usually done by means of a brush, and is known as "brush rendering."

Another method of surface treatment is to expose the aggregate by rubbing the surface vigorously with a wire brush. This process may be hastened by the application of diluted hydrochloric acid, which has the effect of removing the cement on the surface. If acid be used, the surface should be washed after treatment.

When dealing with the surface of floors, it is preferable to apply any rendering which may be required immediately after the concreting operation has been terminated, and before the concrete has set hard.

For the coloring of the concrete the following process has been advised by some of the members:—

For coloring concrete or rendering, care is necessary in selecting colors. Venetian red and Indian red should never be used, because they are heavily loaded with calcium sulphate, which often causes the cement to disintegrate. Red haematite, some red ochre, and many other of the iron ores, particularly if burnt, are safe and suitable. Red haematite has a very powerful effect, very little being needed. Yellow ochres are suitable and safe, and have considerable coloring power. Burnt lumber is safe, and gives a nice warm color. A satisfactory color has not been found in blue or green. Copper arsenide gives a fair green, but it is not desirable. Ultramarine is unsafe. Black oxide of manganese is probably best, but it is not possible to get a clear black. Ground hard-burnt coke may be used, but it is not so good. Ground coal or lamp black are quite inadmissible, except in the case of some of the anthracite coals. A clean white is not obtainable, except by using a white cement. A near approach to white may be obtained by the use of slaked white lime; the lime carbonates on the surface and forms a permanent and almost white color. A cream color which looks very well may be obtained by the use of slaked lime with a little yellow ochre. Chalk and whiting do not give very satisfactory results. In all cases but that in which slaked lime is used the color in sufficient quantity to give the desired tint should be mixed (preferably ground) with the dry cement. Hand mixing is not satisfactory. Slaked white lime should be freshly made, but perfectly slaked, and should be mixed with the cement and aggregate at the time of using. By blending the colors named, all usual building material shades of red, brown, buff and grey may be obtained, and they are all permanent and safe.

Finally, it is possible, of course, to obtain very pleasing effects by the use of rough casting, and also by the introduction of flints or other stones placed by hand in the moulds and surrounded by cement.

Some of the Replies Received

(1) Rough casting is the best finishing coat for exterior finish. In applying a cement rough cast, however, a bonding material should be used to insure adhesion to the old concrete. For floors, stairs, walls, and internal finish generally, tiles and granite finish may be employed; there, also, the use of a bonding material is advocated.

(2) Blue stone dust trowelled to a glass face before the cement is set is advocated for facing the concrete, without any rendering. For rendering mortar composed of 1 part of sand to 1 part of pure Portland cement is advocated with trowelled finish.

(3) In surfacing the concrete without rendering it is advised that the surface of the mass concrete should be beaten down level and smoothed with a wooden or metal float just as it is beginning to set according as to whether a dead or bright surface is desired. It should never be faced, as is often done, by the application of a thin skin of a finer material, which, when applied, if the mass has partly or wholly set, nearly always comes off. Micaceous, clayey, silty or ochreous sand or gravel should be avoided, particularly micaceous sand, the mica in which if the [illegible]

much worked, rises to the surface and causes constant dusting. If a face is to be faced with a finer or richer class of concrete, then use that used for the body. If a facing material is not used, the concrete should be mixed plastic and worked up and down and to and fro with a shovel, trowel or rod all along the faces which are to be exposed, and particularly along the arrises. Concrete for such work requires to be properly proportioned so as to be without voids. On removal of the forms any roughness may be removed by rubbing with a piece of sandstone and water, or the face may be rubbed with a mixture of sand and cement by means of a wooden float, but this latter is not recommended if oil or soap has been used on the moulds, as the thin skin frequently fails to adhere and weathers off. If rendering is employed, Portland cement of clean, gritty sand or fine gravel is the best; the cement should be so proportioned as to rather more than fill the voids in the aggregate. It is not desirable to render with neat cement as hair cracks generally ensue.

(4) A facing mixture, usually 2 parts of sand to 1 of cement, put in the mould against the face of the form with the concrete behind it, has been found satisfactory. For coloring such a facing ochres have been found satisfactory, especially if not used in excess; they have apparently little effect on the durability, and with a white cement a little color goes a long way. Greys of all shades can be obtained by admixture of lampblack. All the colors seem to fade until the work is matured, but afterwards stand perfectly well. The ultimate color can always be found by experiment.

(5) A good sound skin can be obtained by specially tamping the concrete against the shuttering. All seams or joints between successive lifts require special attention. If the surface be pitted with small airholes, a mixture of fine sharp sand and cement proportioned 2:1 should be applied with a large brush and immediately rubbed into the surface with steel trowels or floats.

(6) If rendering be used, it should be proportioned 2 of sand or very fine aggregate to 1 of cement; in no case should neat cement be used.

(7) The most satisfactory way of facing concrete in situ without rendering is to apply a plaster in the form of cement mortar against the shuttering, as the concrete is put in, keeping the plaster a little higher than the concrete and carefully working the latter into the mortar all in one operation.

(11) For residential or street architecture cement finish is best, and can be varied almost to any extent by polished finish, wood float finish, coarse or fine sand, white sand, red sand, yellow sand; further, there is the scagliola finish, but it is, of course, very expensive; the cement can also be tinted a brick red and jointed, and a brick finish obtained. Two to one of sand and Portland cement is best for rendering. The cement should be plastered in the ordinary way, but with greater pressure than for ordinary plaster, indeed, the more pressure the better. The best form of coloring should be colored sand.

(24) Forms or shuttering may be coated with a lime-wash made of pure lime ,slaked with boiling water, and applied when hot. Before application a large cupful of linseed oil or tallow should be added to each pailful of hot lime; this assists in closing the pores of the wood and prevents the adhesion of concrete.

(25) In executing concrete without rendering, if the boards are planed and covered with thick oil paper the surface is good enough for whitewashing. The best rendering is cement and sand outside and putty and plaster inside.

Cracks in Concrete

In a report on this subject the committee say:—

The cracking of concrete is unsightly, but is not necessarily dangerous. Cracks in concrete may be divided into two classes: (1) Surface cracking; (2) body cracking. In the first category the cracks are often referred to as "hair" cracks, by reason of their fineness and semblance to hairs, and occur both in plain and reinforced concrete. They are also known as "crazing," and are of very frequent occurrence. They appear to arise from the surface skin of cement mortar being richer in cement than the mortar of the body concrete, thus exposing almost a neat cement skin, which expands at a different rate on exposure to the sun's rays than the body concrete. It is worse upon the uppermost face in a mould, where the lighter and weaker particles of cement work up to the top and form a skin known as "laitance." If work be kept under water, and sometimes if shielded from the sun, this crazing may not occur. To overcome its unsightliness the surface skin should be removed either (1) by brushing the concrete when green with wire brushes; (2) by rubbing by means of a stone or piece of concrete and sand and water; (3) by dressing with hand or pneumatic operated chisels and hammers; (4) by brushing the surface with hydrochloric acid and subsequent washing with clean water. The last two named methods are best with completely hardened concrete.

The cracks extending through the body of concrete may be ascribed to the following:—

(1) Faulty design and construction so far as statical resistance is concerned.

(2) Expansion of cement or concrete.

(3) Corrosion of embedded steel.

(4) Shrinkage from setting and hardening in air.

(5) Difference of temperature in different parts.

(1) Under the first head the following causes have been noted:—

(a) Settlement of the foundations.
(b) Too high a stress in the reinforcement, resulting in excessive deformation.
(c) Too thick covering of concrete, in particular where the effective depth of beams is very small.
(d) Too early removal of forms.
(e) Defective design of forms with inadequate allowance for contraction and expansion due to variation of moisture. Dry timber may expand and crack the concrete unless wetted beforehand.
(f) Careless removal of forms, which may result in cracking the concrete by shock of falling timber, or by levering and prising on the green concrete.
(g) Vibration, resulting in deficient adhesion and excessive deflection. Forms should be very rigid.
(h) Insufficient allowance for continuity, fixity, and general monolithic nature of concrete work done in situ.
(i) Too close spacing of steel, so that there is no room for the concrete to get round and adhere or bond with the bars.

(2) Expansion of cement or concrete.

Under this heading the following causes of cracking are noted:—

(a) Overlimed and coarsely ground cements which were frequently met with years ago caused expansion, to overcome which it was necessary to leave room for expansion—i.e., expansion joints. Especially was this precaution adopted round the edges of floor slabs adjoining walls.

(b) Coarse materials containing sulphur compounds, unburnt fuel, oxidisable or hydratable iron compounds, unslaked lime, and other deleterious substances.

(3) Corrosion of embedded steel.

Should the steel in reinforced concrete corrode by reason of porosity of the concrete or the presence of deleterious substances in the coarse materials of which it is made, or by electrolytic action, the concrete cover to the bars will crack and burst off.

(4) Shrinkage from setting and hardening in air. This is probably the most frequent cause of cracking. Concrete will expand slightly in water and contract on drying out, so that cracking is frequently not evidenced from this cause until the concrete is allowed to dry, varying usually up to two months, and in thick mass walls moisture and heat are retained for a long period, and may delay cracking up to six months and even longer. It is usual to keep concrete wet for several days after manufacture in order to ensure it gaining maximum hardness, and it is specially important to prevent rapid drying by sun and wind, so that the surface of concrete should be shielded against such exposure. A dry mixture of concrete shrinks less than a wet mixture, and concretes richer in cement contract more than lean mixtures. For reinforced concrete work medium wet mixtures are desirable, and therefore concrete richer in cement than 1 to 5 is not advisable for certain walls.

As the rate of shrinkage varies with different proportions of the concrete ingredients—cement, sand, coarse material, and water—variation in such proportions should be avoided as much as possible. Cracks in plastering are often due to such irregular contraction.

(5) Difference of temperature in different parts. Considerable differences of temperature will cause cracking, and should be avoided as much as possible

Tensile Tests of Concrete

A series of tests on concrete specimens measuring 18 inches long by 6 inches square has recently been made in the engineering laboratory at Cornell University.

The specimens were of three different mixtures, the first a 1:2:4 mixture containing limestone crushed to pass a 1½-in. ring, the second a 1:2:4 mixture containing sandstone, crushed to pass a 2½-in. ring, and the third a 1:2½:5 mixture containing crushed sandstone similar to that of the second mixture. In six tests the 1:2:4 limestone concrete showed an average tensile strength of 278 lb. per square inch, the highest being 308 lb. per square inch, and the lowest 253 lb. per square inch. In nine tests, the 1:2:4 sandstone concrete showed an average tensile strength of 150 lb. per square inch, the highest being 178 lb. per square inch, and the lowest 128 lb. per square inch. In nine tests, the 1:2½:5 sandstone concrete showed an average tensile strength of 129 lb. per square inch, the highest being 179 lb. per square inch, and the lowest being 97 lb. per square inch.

It is worthy of note that in many instances particles of sandstone were split in two in the plane of the fracture instead of breaking the bond with the mortar; this was particularly so in the case of the red sandstone, and illustrates the importance attaching to the skeleton of aggregates for employment in concrete work.

Proposed Drummond Building, Montreal

Mr. H. C. Stone, Montreal, has designed the ten-storey office building shown in our cut. It will be known as the Drummond Building, owned by the Island Land Company, and it will be situated on the north-west corner of St. Catherine and Peel streets, Montreal, on a site 125 x 125.

The frame is to be of steel, and the exterior of Indiana limestone, with the exception of the base, which will be of granite. A court in the rear will ensure a good light to all the offices. The ground floor will be devoted to a large store, and the remainder of the structure to offices, which will number twenty-one on each floor. A toilet room will be provided on each floor. The entrance to the offices, on the west side of St. Catherine street, will be finished in marble, with wrought iron elevator front. The floors are to be of hard wood on terra cotta arch construction.

Drummond Building, Montreal, as it will appear upon completion.

There are to be one freight and three passenger elevators. In the sub-basement the ventilating and heating plant will be placed, while the basement will give ample room for storage. Two fire escapes will be situated in the rear. The building is estimated to cost about $600,000. The Norcross Bros. Company, Montreal, have the general contract, the steel work being by the Dominion Bridge Company.

The St. Croix River Bridge

By C. A. P. Turner, Minneapolis

THE Wisconsin Central Railroad, now leased by the Soo Line, and forming the Chicago Division of that road, is being rapidly improved in order to offer to the traveling public service second to none between the Twin Cities and Chicago. The shortening of the line and the reduction of the grades by a number of changes in location are almost completed.

One of the most marked improvements is in that portion of the line near the St. Croix River, 7 miles above Stillwater, Minn. This new cut-off crosses the river at an elevation of 180 ft. above mean water level, and presents some novel and interesting engineering features. The bridge structure is 2,600 ft. in length. The river bed at this point is 1,800 ft. wide, between high sandstone bluffs, but the full width is overflowed only at high water. The material forming the bottom seems to be fairly uniform throughout, consisting of fine sand and silt, easily eroded, and extending down from 100 to 120 ft. to bed-rock.

The piers of he old bridge, ¾ mile below the new, are of masonry resting on wooden piles, cut off and capped with timber in the old-fashioned style. They seem to have been gradually shifting down stream, and to have moved from 6 to 8 in. from their original position at the top, as determined by observations from year to year.

One of the holes drilled to bed-rock, in the line of the new bridge, developed a flowing well, delivering, by Artesian pressure, a 2-in. stream of clear spring water 12 ft. above the river level.

With such conditions to meet, the problem of economic and satisfactory foundations required as careful consideration as that of the superstructure.

Selection of Type and Design—When foundations are inexpensive, no type of structure has been evolved which is less in cost than the tower and girder trestle, and a design using 100-ft. girders between bents and 40-ft. girders over towers was examined, and this, in turn, was compared with trestle approaches and five 350-ft. arch spans, both in reinforced concrete and in structural steel.

The reinforced concrete design required more expensive foundations, and, for a single-track bridge, offered insufficient economy in the superstructure to offset such expense.

The superstructure of the trestle design could be built for nearly $60,000 less than the arch bridge. Riprap for piers, on the other hand, would cost $10,000 more for the trestle, due to the increased number of piers; piles would have cost $25,000 more, and concrete $60,000, leaving a net saving for the longer spans of approximately $35,000.

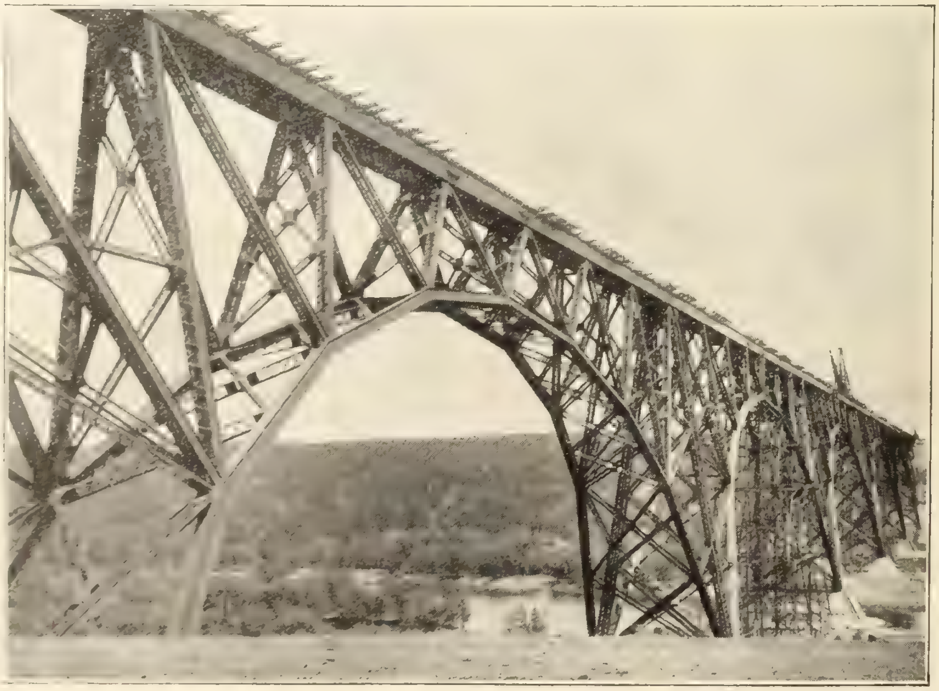
A design intermediate in cost was submitted by the McClintic-Marshall Construction Company, using 200-ft. lattice girders between towers.

A further advantage possessed by the structure of longer span is the longer and wider piers and the decreased probability that they might be weakened by erosion. The box-girder top chords give a width of floor of 12 ft. from out to out, and 6 ft. 2 in. between flanges, which is more satisfactory than the floor of the ordinary girder bridge.

Foundations—The trestle foundations and end abutments rest on sand rock. The four intermediate piers rest on piles, as at their location it is from 100 to 125 ft. to bed-rock.

The piles are of Norway pine, from 70 to 85 ft. in length. The penetration ranged from 50 to 80 ft. No grillage was used, the piles projecting about 4 ft. into the concrete mass of the pier. There are 110 piles in each pier. Most of them were driven by a steam hammer, and the time of driving ranged from 25 to 40 min. per mile. The penetration at the start was about 2 in per blow, and, under the last blows of the hammer, it ranged from nothing to ¼ in.

The concrete for the piers was mixed on top of the



St. Croix River Bridge—Closure of centre span.

bluff, on both the east and west sides, and was distributed as follows: A light timber trestle was constructed about 6 ft. higher than the top of the piers, and to one side. At the east end, the concrete was carried by a chute to a hopper and elevated sufficiently above the floor of the trestle to spout into a ½-yd. car. At the west end, a cableway carried the concrete from the mixer over the main channel to the end of the trestle, a distance of approximately 400 ft.

Type of Span—The type of span adopted was the three-hinged arch, with trusses battered 2 in. in 12. This inclination of the trusses renders them remarkably rigid in a lateral direction, and involves some skew details in the connections. Then, by a simple expedient, these were all reduced to simple bends.

For example, in the lateral connection for the bottom chord in the first panel beyond the shoe, the plate is bent centrally, about an axis transverse to the truss, to the same angle as that made by the inter-section of the main chords projected on a vertical plane, while longitudinally there are two different bevel angles to meet the flange of the chords of different inclination. Slotting the plate, on the line of the transverse bend, to its intersection with the lines of longitudinal bend, leaves them simple bends, in place of die forgings.

The advantage of the three-hinged over the two-hinged or restrained type may be summarized as follows:

First—The stresses are statically determinate, and provision is made for temperature stresses.

Second—The frame adjusts itself to any inaccuracy of the foundation work, or slight settlement, without material change in the stress of the various members.

On the other hand, the ordinary three-hinged arch is inferior to the two-hinged in point of stiffness, and has generally been considered unsuitable for railroad traffic. The depth of many three-hinged arches has been made so attenuated on approaching the crown that the complaint concerning this type in that form is well founded.

In the design of the St. Croix River Bridge, the depth of the crown is 25 ft. and the rise is 124 ft., so that the truss has ample depth throughout.

In order to combine the advantages of two-hinged and three-hinged arches, as far as practicable, the connection of the central top chord was made in the form of a friction joint of five plates, two of bronze and three of steel, giving six fricion surfaces. As soon as the live load comes on the central chord, these joints lock by friction as firmly as though riveted, and the frame then deports itself as a two-hinged arch.

This feature of the design, together with the inclination of the truss, renders the structure one of the most rigid in existence.

Erection—The bridge was erected from both ends toward the center. The equipment consisted of four derrick cars, a lighter one at each end being used for unloading and sorting the material and bringing it to the end of the bridge, where it was handled by the heavier cars.

The end arches, throughout, were erected on falsework which was placed by the derrick cars as the work was built out.

The most difficult part was the erection of the first panel of the end arches. On the east side, a falsework bent was put up, supporting the 100-ft. girder; and, on the west side, the end vertical of the arch was supported on a crib pile of timber until the end bottom chord could be placed and the connection at the shoe made.

Special Features—In erecting past the center top chord, it was found simplest to support the center top chords from a timber bent down to the pin and to the outer end outside of the line of the chord, and slide it inward to position laterally after the succeeding chord and diagonals had been erected in place.

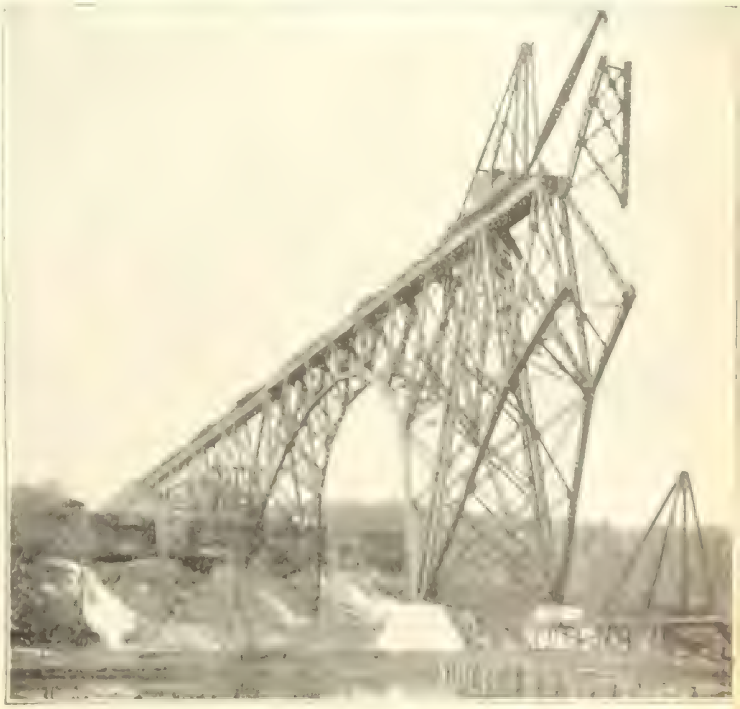
In building out the end arches, the compression of the timber falsework allowed the members to drop slightly below grade. The jacking up was done by taking advantage of the temperature changes between morning and noon. At about sunrise the shoe at the skew-back was wedged out; then, as the temperature increased, the expansion of the steel would raise the span from the falsework, the shim wedges would be driven home; then, as the temperature dropped, ½ or ¾ in. could be gained at the shoe.

The skewback was arranged as follows: A cast-steel shoe was given a horizontal bearing on a bolster frame built into the concrete. This frame was arranged with a projecting vertical center member, against which the vertical end of the shoe could thrust. Steel blocking was provided between the vertical impost member and the end of the shoe, calculating for a clearance of about 9 in. Screw-wedges were provided for the adjustment of the span, so that this distance could be increased, to raise the crown of the arch, or decreased, if found to be above grade when erected.

In closing the first arches, erected wholly on falsework, this clearance proved none too great to get the shoe in place, and the scheme of jacking by temperature changes enabled the erectors to force it out so that the wedges could be entered.

The adoption of inclined trusses, with bent plate connections to the top chords, leaving the chord in a vertical position, is a somewhat unusual feature in bridge design.

The board and exceptionally rigid floor system secured in the 50-ft. panels of the structure would seemingly warrant its adoption, from the economic standpoint, in deck bridges where the depth is not sufficient for arch construction. The elimination of floor-beams, floor-beam connections, and the combination of stringers and chords in one member, with ample width of



Erection of half of second arch as a cantilever [illegible] will generally result in a material saving of metal. The structure was designed by Cooper's E 55 loading.

The work was executed under the direction of Mr. Thomas Greene, Chief Engineer of the Minneapolis, St. Paul and Sault Ste. Marie Railway, the writer acting as Consulting Bridge Engineer. The Kelly-Atkinson Construction Company was the contractor for the erection of the work, and the American Bridge Company furnished the steelwork. The concrete work was executed by the Railroad Company. The pile-driving was done by George W. Oakes and Company, of St. Paul, Minn.

Concrete Surfaces

THE surface appearance of concrete, particularly with regard to the application of special facings and the prevention of unsightly or dangerous cracks, is a matter of vital interest to the engineer, in concrete either plain or reinforced. It is not surprising, therefore, says our London contemporary, The Surveyor, that the Reinforced Concrete Practice Standing Committee of the Concrete Institute should have devoted their attention to these subjects, in regard to each of which they have recently issued comprehensive reports. These interesting documents (extracts from which will be found in another column) were read and discussed at a recent meeting of the Institute. In regard to cracks, the report is based upon the replies received to certain quesions which were circulated among all the members of the Institute. It must be borne in mind that the most serious cracks in concrete work are not the hair cracks which not infrequently make their appearance upon the surface but which are fortunately capable of removal by one or other of the well-known processes available for that purpose. Far greater anxiety is caused by those larger cracks which extend through the body of the work, and are at times a positive danger to an entire structure. Faulty design or workmanship are often the direct cause of these occurrences, and particularly, perhaps, the removal of forms before the work is sufficiently set. In regard to this matter the committee have made some very valuable suggestions as to the length of time which should be allowed to elapse before the removal of the forms in various cases. Then again, cracks are often caused by expansion of the cement or concrete (frequently due to the use of coarse materials containing various deleterious substances), or by the corrosion of embedded steel. In other instances cracks have been caused by shrinkage from setting and hardening in air. It is pointed out in the report that concrete will expand slightly in water and contract on drying out, so that cracking is frequently not evidenced from this cause until the concrete is allowed to dry, which may be some months after the work has been completed. Most engineers who are called upon to use concrete to any considerable extent have experienced cracks due to one or another of the causes named, so that the labours of the committee in extracting principles from the practical experiences of a large number of engineers will, no doubt, be very widely appreciated.

The surface treatment of concrete forms the subject of a separate report, which contains a summary of the replies received to a circular letter issued to all the members of the institute, together with some general conclusions drawn by the committee from the information thus obtained. The most usual way of obtaining a smooth surface appears to be by means of a careful preparation of the moulds, and the application of a liquid mixture of concrete of such consistency as will allow of the smaller particles of the aggregate and the cement being brought towards the outer surface. This report also contains much information as to the colouring of concrete.

Concrete Dropped 1,000 Feet

Dropping concrete into forms 1,000 feet below the level of its discharge from the mixer, was a task successfully performed in the application of a concrete lining to the 1,017-foot Kingdon double shaft of the Old Dominion Company, at Globe, Arizona.

The concrete shaft lining was applied in successive rings 150 to 220 ft. high, beginning at the top. The forms, in 12-ft. sections, were built on temporary timbers placed along the sides and ends and across the center of the shaft; and each ring contained at its bottom a reinforced concrete section 4 or 5 ft. high as a bearer. The concrete was chuted through a 4-in. pipe from the mixer at the head of the shaft. At the lower end, this pipe discharged into an ordinary steel bucket suspended from the finished portion of the lining above. In the side of the bucket was a hole connecting with a short steel chute which delivered the concrete directly into the forms. The mixture was fed in regularly at the surface, the upper end of the 4-in. pipe being closed by placing a piece of canvas over the opening to stop the air-current in the pipe and check the velocity of the concrete. The mixture was so dry that no water appeared upon the surface after being well worked. Had a wetter mixture been used, the water would have separated from the sand and stone, taking the cement with it and leaving a lean concrete behind. The long walls of the lining were given a maximum thickness of 10 in. Old water pipes were cut into short lengths and placed in the concrete for weep holes through the wall. The concrete was a 1:3:6 mixture, with the coarse aggregate varying from ¼ to 1 in. in size.

Steel and Concrete Drop-Shaft

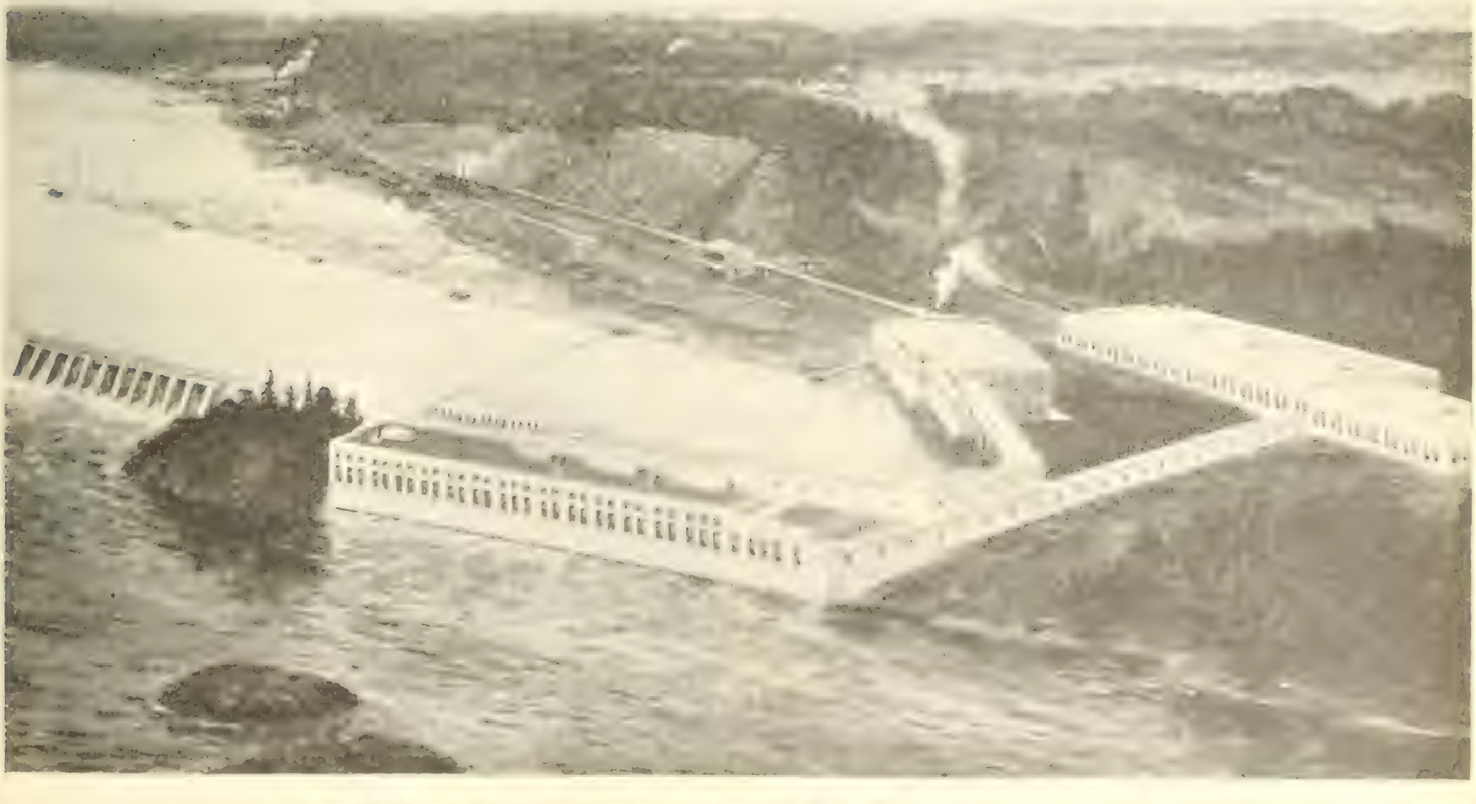
A steel and concrete drop-shaft was sunk through about 100 ft. of sandy over-burden during recent mining operations in the Michigan copper country. The method is described in the March 8 issue of the "Engineering and Mining Journal." The drop-shaft casing was made of annular sections of steel plate, 8 ft. in diameter at the top, but each ring being of slightly smaller diameter, so that each section bolted inside the preceding one. The sections were overlapped 4 in. The two lowermost rings were of ½-in. plate; those above were 3-16 in. thick. A ⅝ x 6 in. angle was fastened to the bottom plate to stiffen the bottom and give a somewhat stronger cutting edge. This angle-iron ring, furthermore, facilitated the concreting that was to follow. The first 50 ft. of the shaft were sunk in winter without any trouble being experienced, as the ground froze and stood without support. The thickness of concrete was proportioned to give weight enough to overcome a frictional resistance of 400 lb. per square foot. No allowance, however, had been made for the fact that the 50 ft. of sand that stood without support would offer little resistance to the settling, and as a result the drop-shaft sank down through the overburden faster than the sand could be excavated, causing no difficulty other than that the cutting edge was bent up somewhat by forcing boulders out of its path. The concrete lining of the steel ring was put in from the bottom up in the first 50 ft., collapsible wooden forms being used. The shaft opening within the lining was octagonal. The central rectangle, formed by joining the two shorter sides, was used for hoistways, ladders and pipes being carried down the corners. Several 10-in. channels were put in at 6-ft. centers to carry the center guides, which in the concreted part of the shaft are 6-in. channels. The end guides were secured by brackets set in the concrete. After the concreting in the first 50-ft. section had been carried up to the surface, further steel plates were bolted to the completed portion; the collapsible wooden form was moored up and a new section concreted, the operation being repeated as rapidly as the drop shaft sank. When solid rock was reached the material within this steel-and-concrete caisson was excavated. A smooth shelf was then cut in the solid rock by a hammer and drill and the joint was sealed with concrete. Work was started about January 1st, 1911, and the drop shaft was completed about April 1st. The total cost of the work was $57.58 per ft. Provision had been made for an air lock, had it been necessary to sink through a heavy flow of water, or very wet ground.

In the course of an address delivered by Mr. Frederick Tench, of New York, the design, erection, and employment of derricks in structural work were discussed at some length. It was pointed out that accidents in connection with this class of appliance are due not only to the use of imperfect derricks, but also to the improper use of good derricks. Inadequate guying, insufficient anchorage of the stifflegs, sudden strains occasioned by slipping loads, and neglect of lubrication are things to be carefully avoided.

Power and Industrial Development at Iroquois Falls, Ont.

THE contractors (Messrs. Morrow & Beattie) are reported to be making good progress on the dam and power house of the Abitibi Pulp and Paper Mills, Limited, at Iroquois Falls, Ont. At first a ground wood pulp mill, with a capacity of 180 tons per day, will be constructed; later a chemical pulp plant will be installed, and eventually paper mills will be erected. The company have secured leases of the Iroquois Falls, capable of developing 22,000 horse power; Couchiching Falls, 18,000 horse power; and Twin Falls, 18,000 horse power. At present it is proposed to develop the Iroquois Falls to the extent of 17,500 horse power. Mr. Henry Holgate, the consulting electrical engineer, is of opinion that there will be sufficient water all the year for the company's requirements. At present there is a drop of 23 feet at Iroquois Falls, but this will be increased by the contractors to 36 feet.

Of the power to be generated, about 15,000 will be used for running 18 ten-ton grinders, and in addition 3,000 horse power of electrical energy will be utilised. The capacity of the wet machine room will be 200 tons, and in the wood preparing room the slashers will deal with 600 cords per 10 hours, while the barkers will treat some 20 cords per hour. The saw mill will have a daily output of 25,000 feet, and the dry kilns of 7,500 feet per day. A wood working mill, with planers, matchers, etc., also a machine shop fully equipped with lathes, planer and drills have been erected. The buildings will be completed by December 1st.



Plant of the Abitibi Pulp & Paper Mills as it will appear when completed

Constructional Activity at Port Arthur

Contributed by Joseph Redden

PORT ARTHUR, Ont., which is coming into increasing prominence as a lake port, offers every evidence of outstanding activity this season. The city's progress is hardly to be wondered at when it is considered that the site which Port Arthur occupies is a point of considerable advantage in industrial expansion, situated as it is at the head of a deep waterway where material can be landed at the minimum cost.

It is worthy of note that a site of four hundred acres with water frontage is being held at the request of European capitalists, who are arranging the details for the erection of a steel plant, the initial expenditure upon which will be $5,000,000.

The Canadian Stewart Company has the contract for a large modern business block to be erected on the Main Street of Port Arthur by Mr. James Whalen and his associates. This will be ten storeys high and cost $500,000.

The proposed Port Arthur Building.

As the transferring of freight from vessel to rail or warehouse, and the handling of grain is one of Port Arthur's great assets, it will be taken for granted that the construction of the class of buildings suitable for this work will also be progressing and such a surmise will not be amiss. The first of these buildings to be improved, or rather enlarged, was Port Arthur's great elevator, which is owned by the Canadian Northern Railway and operated by the Port Arthur Elevator Company. Previous to its last addition of a 2,500,000 bushel unit, it was the world's greatest grain storehouse, and now with that addition making its storage capacity 9,500,000 bushels, it will be, if possible, even more so, even without the further unit of 2,500,000 bushels which is immediately contemplated and which will complete this plant.

Western Dry Dock and Shipbuilding Company's operations at Port Arthur.

Besides the addition to this granary, there is being constructed in Port Arthur, by the Barnett & McQueen Company, for the Dominion Government, a 3,250,000 bushel elevator, to cost $1,250,000, which is being built next to the $1,750,000 elevator of the Thunder Bay Elevator Co. The foundation of this elevator is now finished and the superstructure is being proceeded with rapidly as the building must be finished to handle this year's crop. Alongside of these two elevators there is also to be constructed immediately a 2,500 barrel flour mill and storage elevator by Messrs. Smith & Davidson. This firm have hitherto been operating a small elevator but are branching out into a larger development which needs a more suitable site. This building will cost $500,000 and construction will be started immediately.

Besides these structures, there is also a big development in smaller buildings. The plans for the new Custom House are about ready to be placed before contractors for prices, and it is estimated that it will cost about $80,000. Work on the Armory, estimated to cost $150,000, has been commenced by the Stewart Contracting Company. The Presbyterian organization have let the contract to the Marsh, Hutton Powers Company for the erection of a $75,000 church, the foundation for which was constructed last year. The Oddfellows are asking for tenders for their block, which is estimated to cost $40,000. The Roman Catholics are about to begin the erection of a $100,000 church, the plans of which have just been approved. About fifty residences, ranging in price between $3,000 and $5,000, are now under contract, or tenders asked for, and a large number of workmen's dwellings are also under contract. This class of building is greatly needed, as

Building the foundation of the 3,250,000-bushel government elevator at Port Arthur.

the number available is at present far below the actual requirements of this city.

Altogether, Port Arthur will have a busy season. The contracts let and immediately contemplated total nearly $5,000,000 from now on. Doubtless, Port Arthur will keep well in front in the list of building developments for Canadian cities.

The Vancouver Club Building

CONSTRUCTION work is proceeding actively on the new four-storey Vancouver Club Building, which is being erected on Hastings Street West, Vancouver. The building is of reinforced concrete construction, with pressed brick and terra cotta facing on the front elevation, and Dennison tile facing on the remaining walls. The design is modern Renaissance with classic columns and pilasters. The entrance will be attractively treated in terra cotta. Marble flooring and oak wainscotting will be used in the entrance hall. A large card room, 25 x 50 feet, will be located on the ground floor in the rear. The second floor will contain a main dining room, 50 x 60 feet, a private dining room, 40 x 25, and a ladies' lunch room, 30 x 25 feet. On the third floor there will be situated a billiard room, card room and reading room. The remaining storey will be occupied by 28 bedrooms. All floors are finished in hardwood with marble borders. Oak will be used as interior finish for all floors except the fourth, which will be finished in cedar. The plenum system of heating will be installed. The cost of this building including the furnishings, is estimated at approximately $350,000. Messrs. Sharpe & Thompson, Vancouver, are the architects, and the construction work is being carried out by the Norton Griffiths Company.

Vancouver Club Building under construction.

Driving belts, states a contemporary, often undergo improper treatment. If they fail in their work by slipping over the pulley without driving it, what is usually resorted to is resin, which is certainly a good help for the time being, but is sure to spoil the belt, making it rough and brittle. In a dusty room an emery-like mixture is formed by the dust and the resin, which rubs away the belt. Moreover, the adhesion preparations, sold to prevent belt slip, are not always to be recommended, and often contain harmful acids. Care must be taken to avoid putting an unreasonable overload on the shafting, and to see that the pulleys are properly arranged in respect to diameter and distance apart. In the case of a new wet-stretched belt it is advisable to make a careful examination of its structure, especially in respect to flaws, etc. The outer surface should then be thoroughly greased with a mixture of melted tallow and train oil, which should be rubbed in so that it saturates the leather. This imparts, first of all, lasting elasticity and a very high degree of durability, and afterwards keeps the belt pulley in good condition, as the grease permeating the leather is carried over it, leaving a coating which is of such a nature as to ensure almost perfect adhesion to the pulley. When this coating has vanished, which will ordinarily happen in three or four months, the greasing of the belt should be repeated, after it has been well rubbed beforehand with sand paper. Where the temperature is comparatively high this fresh treatment becomes necessary more frequently. The use of resin or any strong adhesive substance should be resorted to only in exceptional circumstances.

A German exchange gives the following directions for making marble: 1. Burnt gypsum is saturated with a solution of lime in alum water, burnt again, ground finely, or rather pulverized, adding 1-12 by weight of the gypsum of alum, and cast in the mold. These harden very slowly, but attain the hardness and transparency of marble. Different pigments may be added to obtain different colored marbles. 2. Pieces of burnt gypsum, the size of the fist, are put for 3 hours in a 12 per cent. solution of alum in water of a temperature of 85° to 104° F., burnt again, pulverized, adding 1-16 powdered alum, and lastly worked into molds with water containing 1-16 sal ammoniac for each part of gypsum. Castings made of this combination possess great hardness and brilliancy.

An inside roof gutter has been used in a Cleveland foundry where the sloping roof of a wing intersects, at the eave line, the clere-story wall of the main building. In order to provide for drainage a clear opening of 3 in. is left between the steel roof and the vertical siding. Just below it there is placed a channel-shape gutter, 12 in. wide, made of 18-gage sheet-iron supported from the wall columns. The gutter supports extend across the faces of the columns and carry cantilever foot walks giving access to the gutter for cleaning or repairs. It is stated that the gutter has withstood snow and sleet storms and heavy rains without leakage and that the opening through the side wall at this point is not considered objectionable.

The Rock Island filters showed in 1912 an average colony count in the effluent of 67 bacteria per cubic centimeter, with 10 per cent. of the samples showing gas formers. In the raw water, according to Mr. R. W. Sharp, superintendent of the waterwarks department, in a paper presented to the Illinois Water Supply Asociation, there was an average of 7,660 bacteria per cubic centimeter, with 82 per cent. of the samples producing gas. The average color was reduced from 75 to 15 parts per million. During the year aluminum sulphate and bleach were not used in parallel at all times, but were alternated in order to check different modes of operating the plant with the various changes in the raw water. As considerable difficulty was experienced with the original 350 ft. of coagulent feed piping, Mr. Sharp states that fiber pipe and rubber hose were installed in July 1912, and up to date have given much better results.

Methods of Obtaining Artistic Texture in Concrete

A paper read before the National Association of Cement Users by Adolph Schilling, of Philadelphia, Pa., offers suggestions worthy of careful consideration as to methods of obtaining artistic quality in the coloring and texture of concrete products.

Mr. Schilling emphasized the importance of close co-operation between the stone caster and the stone cutter, as a means of securing the two qualities—texture and dimension—which are so essential to artistic quality in the artificial product. For six years, he tells us, his concrete stone and natural stone plants have been under one roof; and, in his opinion, these conditions greatly aided in procuring a first-class composite stone of proper size and finish.

In discussing methods of surface treatment, he recommends the adoption of methods similar to those employed in other lines of manufacture in treating surfaces. For example, in acid washing, he suggests the advisability of immersing the article in a bath, rather than applying the wash with a brush. This method of treatment not only results in a great saving of acid, but produces a class of work that cannot be obtained with the scrubbing brush. A very weak acid solution is required; and after the article is placed in the bath, it needs no further attention until removed. This method of treatment also preserves the edges and details of the design, and makes the surface uniform. If, upon removal, it is found that there are hard spots not sufficiently affected by the acid bath, they can be treated separately after the article is flushed with clean water. Care must be taken that the aggregate at the surface shall be of nearly uniform hardness, or else pitting of the soft portions will result before the harder particles have been cleaned of the cement coating. This action took place recently on a mixture of black marble with crushed granite. In the acid bath, the black marble, a limestone, was almost completely dissolved, while the granite showed a fine texture and natural color. In this way a very fine piece of work was spoiled by the difference in the resisting qualities of the materials composing the surface aggregate.

Leakage in Water Mains

There is almost always some leakage from water mains. In order to determine this loss, a survey was made in a city of some 3,500 people, in which a private corporation owned the waterworks. During about a month in 1912, according to a paper by Mr. W. D. Gerber, presented at the recent meeting of the Illinois Water Supply Association, the average daily pumpage varied from 680,000 to 700,000 gal. The survey located a blown-out lead joint in an 8-in. main wasting more than 300,000 gal. per day. This leak occurred under a broken-stone roadway and behind a stone arch bridge at a point where the pipe was 14 ft. below the street surface, and the water was finding a ready outlet into the creek.

In another city of 2,000 inhabitants a motor-driven 400,000-gal. triplex pump is used. From October, 1911, until June, 1912, it was necessary to operate the pump practically all of the time to keep up the pressure, and even then it seemed impossible to get a 100-ft. standpipe more than half full. A water-waste survey was made and a 4-in. pipe was found cracked squarely in two, wasting 200,000 gal. daily, which found a ready outlet in an abandoned 12-in. tile storm-water sewer that crossed directly over the crack about 8 in. above the water main. There was no surface indication of leakage, the ground not being wet 2 ft. above the break.

A rather unique method of repairing a concrete wall surface damaged by freezing before setting, was successfully used in the case of a retaining wall on the Pennsylvania Railroad, at South Fork, Pa. The patch has now stood over 15 months, and is apparently in as good condition as when placed. The faulty concrete was removed by a small hand pick to depths varying from 1 to 18 inches. The sound concrete exposed was carefully cleaned; steel dowels were driven into it at six-inch intervals, and a light reinforcing mesh attached to the dowels. Forms were then placed for the face of the wall, the concrete thoroughly wetted, and the holes filled with a 1:2 mortar.

Tests are to be made by the Panama Canal Commission to determine the value of cement mortar, applied to iron plates by the "cement-gun," as a preservative. Twelve plates, 63 in. by 14 in., have been coated with a 1 to 3 mortar of cement and sand, after being cleaned to grey metal by the sand-ballast process. Six of these have been covered with ½ in. coating, and the remaining six with a 1 in. coat on one side and a 1½ in. coat on the other. Three plates of each kind will be kept immersed in salt water, to test the mortar method of preventing corrosion. Two plates of each kind will be taken from the salt-water bath at the end of three months, and one-half of the coating will be removed to determine the condition of the metal. The duration of the test for the balance of plates will be determined later.

A portable hypochlorite plant, similar to the one designed for the Minnesota Board of Health, has been used by the State Board of Health of Virginia. This plant, according to the annual report of Mr. Richard Niesser, director in charge of the bureau of sanitary engineering, has been kept in readiness for emergency use in the event of the unforeseen pollution of a municipal water supply. The essential features of this simple device are a mixing barrel, two storage barrels, regulating apparatus and the necessary connections. The outfit can be shipped at a moment's notice. During the summer of 1912 this plant was used at Leesburg, where the water supply was suspected as the cause of about a dozen cases of typhoid. A similar plant was set up and operated at Petersburg during the period when water for that city was being drawn from an emergency intake on the Appomattox River.

A Chicago coal company which uses fourteen 5-ton motor trucks reports that in the month of November, 1912, each truck was operated on an average of 25.3 days, that it traveled an average daily distance of 27.92 miles and hauled an average of 35.13 tons per day. The average operating expense of each truck for the month was $280.65, the principal items of which were gasoline, $30.84; driver and helper, $89.14; other labor, $17.54; depreciation at 20 per cent., $69.99; tires, $28.32; repair parts, $10.44; insurance, $14.41; garage, $10.00. With loads of 5 tons this would mean 7 trips per day each of 4 miles; or, the load being carried but 2 miles, a ton-mileage of 70 per day and 1770 for the month, making the cost of trucking per ton-mile 16 cents.

Water Supply Problems in the West

Geological Formation and Contributing Agencies—Rainfall and Evaporation—Tapping the Supply — Sterilization — Filtration — Distribution

By R O Wyne-Roberts[1]

EVERY country, district and town has water supply problems to solve. It is rare to find nature so generous as to furnish abundant pure supply of water without leaving some difficulty, more or less great, for the engineer to surmount. We have only to study the conditions in Canada, which perhaps possesses the most bountiful supply of water of any country, to observe that a number of towns and cities are combating with one difficulty or another. The supply of water is either difficult to procure, or it is limited in quantity or it is not pure.

Whilst in the East and extreme West of Canada there is abundance of water, the problem in many places in the Middle West is to find a copious and pure supply, and it will be well to consider why it is often so difficult.

The author, during his career, has had a number of water problems to deal with, but when he visited Regina and was asked by the Corporation to conduct investigations with the view to augmenting the supply, he found new conditions, which had to be carefully studied.

Geological Formation

One of many interesting features which had to be studied was that of the geological formation of the country, and in this connection it may be useful to describe the agencies which primarily contributed to form the topographical features of this part of the country.

The present surface is entirely of glacial origin. When the first great ice invasion of the glacial epoch moved southwards, the surface of the country was doubtless much more rugged than it is today, and the valleys possibly drained in other directions. The great sheet of ice, many hundreds of feet in thickness, advanced slowly southwards, stripping loose material, crushing and levelling rock hills. Stones, gravel and mud became frozen to the ice, and increased the power of the glacier to wear down other rocky excrescences, etc. Enormous masses of crushed rock of many kinds were thus picked up and conveyed from the northern parts across this country into the United States. When the climate became warmer the ice gradually melted back, and huge streams of water, which flowed down from the ice sheets and brought with them great quantities of detrital material, depositing the same in uneven masses, filling up valleys and forming the plains and hills which constitute the principal feature of the prairies. Where this great ice sheet halted from time to time terminal moraines were formed.

The second ice invasion again changed the surface of a large part of the country, disturbing the deposits left by its predecessor and redepositing the same.

[illegible] Canada into the United States in the form of a huge tongue and the glacial deposits can be found over vast territories. These masses of glaciated material vary in thickness, magnitude, shape, character and distribution, and were laid in a most chaotic manner. The districts around Regina, for instance, are from 1,900 to 2,400 feet above sea level, and [illegible] 800 to 1,100 feet above the Lake Agassiz, which was formed in the glacial period. This lake and other glacial lakes extended westward as far as the Elbow on the South Saskatchewan River.

The channels or [illegible] by the streams [illegible] from the ice sheets, have been gradually or partially filled in by sand, silt and gravel washed out of the morainic deposits, building up the gentle slopes and flat plains between the banks. During the ages that have since elapsed, the streams have eroded passages through these outwash plains, and in places undercutting the beds of drift, thereby tapping the underground water-bearing strata and causing springs to appear on the surface.

The fine silt, or mud, composed of disintegrated cretaceous rocks, which were carried by the ice sheets, formed the flat or very slightly undulating land surface of the prairies which constitute the major portion of the country south of Regina. This material, called till, consists of pulverized rock forming impalpably fine clay mud, often intermixed with gravel, boulders and rock. This till, bluish-grey in color, although oxidised on the surface and underneath for a few feet to yellowish grey, is to be found over the country, extending to the Central States of America. It usually underlies the gravel deposits and forms a more or less impervious substratum. The upper portion of this till is commonly soft and easily dug, while below it there is a sudden change to a hard and compact deposit, locally called hardpan. The probable cause of this (according to Mr. Upham) was the pressure of the enormous weight of the ice sheet upon the lower and older till, while the upper till was dropped loosely as the ice melted. The boulders, which are more or less plentiful on the ridges and in valleys, are generally granite, gneiss and schists brought from the North-West, and also limestone—the latter being softer and more easily crushed has been largely reduced to gravel, etc., hence it is that the substratum consists mostly of limestone and clay.

It is important to note that the glacial till consisting of a matrix of clay with pebbles and boulders and forming a more or less watertight mass, has intermingled and interbedded with it in a most extraordinary manner, and often lying above and below it, porous waterlaid sands and gravels, which constitute the water bearing strata. In many places these beds of sand and gravel lie between two beds or till of different epochs of formation, but in a greater number of districts gravel beds of varying depths, thickness and character are to be found under the clay bed drift. It is, however, not possible to trace these beds for a great distance. The calcareous matter has been leached out of the older formation, but in the more recent accumulation it virtually remains without change, consequently the water obtained for the latter beds is heavily charged with mineral salts.

The superficial layer of drift is generally open and fairly loose, with the result that water percolates rather freely into the subsoil. Owing to the uneven manner in which the glacial materials were deposited, and to the undulating nature of the surface, it is inefficiently drained, there is a plexus of [illegible] sloughs and swamps. The drift [illegible] nearly or even to the surface, hence it is that so many farmers are able to obtain a fairly abundant supply of water from shallow wells. In times of drought, however, the water [illegible] will be considerably reduced [illegible] stances it will probably sink below the bottom of such wells. This is also the main reason why sloughs appear to dry up in seasons of drought.

In the case of the outwash sands and gravels to be found stretching out from the moraines, these beds being very porous readily absorb the rain falling upon them.

Sand dunes are found in [illegible] places [illegible]

[illegible]

[1] Consulting Engineer, Regina.

these were formed by sand from the plains drifting with the wind and heaped up in cones or dunes or drifting sand-hills. The period of formation of these dunes was probably soon after the recession of the ice sheets and before vegetation had spread over their surface.

Rainfall

The question which arises after ascertaining the areas of the possible watersheds is the quantity of rain falling on such sheds, more especially in prolonged periods of drought.

As a fairly typical example, we might consider Regina district. There are two rainfall observation stations on which the rainfall in the Regina district may be relied upon. These are the Northwest Mounted Police Barracks and Qu'Appelle. These, however, do not accurately represent the rainfall on the watersheds east and northeast of Regina, because the stations are lower than the watersheds in question.

By analysis of the recorded rainfall at these stations the mean annual rainfall is computed at about 16 inches. The next step to take is to ascertain the rainfall in any three driest consecutive years. The above mentioned records were carefully examined and it was found that it amounts to about 10.4 inches or 65 per cent. of the mean annual precipitation.

Evaporation

The problem that has to be next investigated is that of evaporation, that takes place on the surface of the water and land. Part of the rain percolates into the ground to feed the water-bearing strata, springs, etc., and sustains vegetation. Another part is lost by drainage off the surface of the land into the streams, and a portion is evaporated. In the West, however, snow remains on the ground for months, the ground is frozen to a considerable depth, consequently, not much water percolates down to the substrata during winter. It must be remembered that evaporation goes on throughout the winter; when the spring arrives, much of the remaining water, in the form of snow and ice, when melted will drain away. Furthermore, in Summer, some of the water which has percolated into the ground is absorbed by vegetation. There are, however, several depressions in the land surface such as kettle holes, etc., which retain water until it disappears into the ground or is evaporated. The phenomenon of evaporation is an interesting one, and it is to be hoped that the government will some day arrange for careful observations over a prolonged period to be made, for it has a very material influence on the question of water supply, irrigation, agriculture, etc. In general terms, evaporation is a product of many conditions, such as temperature of the air and water, duration and intensity of solar rays, the dryness and velocity of the air, etc. Evaporation increases with rainfall, but is much more uniform in districts of large rainfall, and in districts of low rainfall it is relatively high. So in years of drought, especially, evaporation constitutes a very important factor in the problem of water supply.

The United States Government has conducted a long series of evaporation on the Salton Sea, California, where it was found that the evaporation ranged from 51 inches in 1908 to 69 inches in 1910. In Ohio it was 45 inches. It may be estimated that from the surface of water it is approximately 50 inches in the West, but what is lost by evaporation from the land surfaces is not possible to estimate at present.

Yield

The yield from watersheds varies in every case, owing to the difference in physical features, such as mountains, valleys, as contrasted with flat or undulating prairies, rocky catchments as compared with porous plains; luxuriant vegetation, trees and foliage on the one hand and "prairie wool" on the other.

In the case of Regina water supply, after taking into consideration the many conditions and approximate similarity with water sheds in the States, it is estimated that by laying extensive collecting pipe lines and sinking wells, about one and one-quarter inches out of ten inches rain in the three driest consecutive years can be secured, but it cannot be assumed that a similar yield can be obtained from any other watershed in the Prairie provinces, for it might be exceeded or be far less as everything depends on local features.

There are available for Regina about 200 square miles of watersheds, and at the above rate, it is estimated that about ten million gallons can be collected and delivered into the city.

Tapping the Supply

Having ascertained what extent of catchments are available the minimum rainfall in driest years, estimated the losses by floods evaporation, absorption and what is collectible, it then remains to be decided how best to tap the supply.

This depends on several conditions, such as topography of the district, substrata in which the water is expected to be found, inclination of the water bearing stratas, etc.

While the author was conducting the investigations into the question of augmenting the water supply, he visited over two hundred farmers and from them obtained information as to the nature of the strata through which they sank wells and in which they found water; he also inspected over 800 square miles of country, and by this and other means in many places was able to locate the existence of water bearing stratas, the direction in which they dipped, and the area of the water sheds. The author recommended sinking wells in Boggy Creek, where works had already been started as it was the lowest point in that part of the catchment which could be utilized, and also the laying of collecting pipe lines in various directions.

Wells—Authority was obtained to carry out the recommendations and in April, 1912, the first well was sunk 108 feet, when a large volume of water overflowed at a height of 12 feet above ground. This well has continued to overflow at the rate of about 150,000 gallons per day. Up to the present time 18 wells have been sunk of which 10 are overflowing, five are choked and three were unsatisfactory. The choked ones can be cleaned when necessary. Some of these wells are five inches in diameter and the rest are seven inches. They vary in depth from 65 feet to 192 feet. The underground pressure and the velocity of flow in some instances were too great to maintain a constant supply, as the large volume of water gushing out of the wells induced too great a current in the water bearing strata and this caused sand and other materials to be conveyed with the stream and choke the wells referred to. To overcome this difficulty it was decided to sink other wells in their immediate vicinity so as to relieve the pressure and this has been partly successful. In some cases quicksand and soft clay cause trouble.

The strata through which the wells were sunk were as follows:—

No. 2—Clay, 6 feet; coarse sand, 20 feet; fine sand and clay, 8 feet; fine sand, 13 feet; gravel and sand, 3 feet; sand, 21 feet; hardpan, 4 feet; depth, 75 feet.

No. 5—Clay, 38 feet; clay and gravel, 5 feet; gravel, 30 feet; yellow sand and quicksand, 17 feet; clay and hardpan, 10 feet; depth, 100 feet.

No. 17—Mud and clay, 40 feet; sand and gravel, 2 feet; clay and sand, 13 feet; fine sand, 17 feet; quicksand and clay, 60 feet; hard clay, 25 feet; clay and sand, 18 feet; depth, 175 feet.

The author, in October last, was consulted by the Carlyle Town Council in connection with the augmentation of the supply of water. After making an inspection of the district around, the Council was advised to sink a well on a certain patch of land. This well was sunk in April 1913 and at a depth of 192 feet water was found, under conditions which were predicted in the report.

Quality of Water—Well water in the prairie districts is charged with lime salts, caused by contact with different kinds of limestone. This is common to almost all well waters in the West. As already stated when the ice sheets were passing over the country, a large quantity of rock was transported, the harder rocks survived the process of crushing better than the soft rocks hence it is that in some districts hard rock boulders are to be found on the surface. It is estimated by the geologists that about 90 per cent. of the surface boulders are of hard rock, and ten per cent. soft rock, but in the substrata the proportions are reversed and we find 90 per cent. of gravel is limestone of various kinds.

Water readily absorbs salts and gases and consequently in its passage through the soil and different strata, mineral salts are being absorbed. In addition to salts, water absorbs gases and as carbonic acid gas is present in the air and in the ground, it is taken up by the water and this increases its solvent powers. When the water finds an outlet to the atmosphere, such as in the form of springs, some of the carbonic acid gas is lost and it becomes less heavily charged with lime and consequently a limited natural softening process takes place.

The water as supplied to Regina, for instance, contains carbonate and sulphate of lime and carbonate and sulphate of magnesia and other chemical constituents. These salts cause the water to be "hard" and the problem is how best to soften it. Hard water used in boilers causes sludge and scale to be formed and these in time not only reduce the efficiency of the boiler, but also tend to cause overheating of the plates and other troubles.

Temporary and Permanent Hardness

The hardness of water is usually divided into two classes, namely, temporary hardness and permanent hardness. As already explained water absorbs lime salts more readily when it contains carbonic acid gas. By heating the water, this gas is driven out, and the carbonate of lime held in solution by means of such gas becomes insoluble and its greater part, together with magnesium carbonate is precipitated and forms sludge. Temporary hardness is that part of the total hardness which is precipitated by boiling.

Boiling will not have the same action on the sulphate, chloride, or nitrate of lime or magnesia, as these salts remain soluble. Permanent hardness represents these salts as well as the parts of the carbonates of lime and magnesia not precipitated by boiling. Temporary and permanent hardness however, are relative terms to denote the characteristics of hard waters.

Apart from the use of hard water for industrial purposes, it is of importance to consider it from the domestic viewpoint. One part of carbonate of lime decomposes 6.12 parts of stereate of sodium, and as soap usually contains only 60 to 70 per cent. of stereate of sodium, about 9.5 (say 10) parts of soap are required. Consequently if 100,000 gallons of water per day are consumed in washing, cleaning and other purposes, in which operations soap is necessary, it is a simple calculation to ascertain the consumption of soap necessary to produce lather.

Each part (or one pound) of carbonate of lime per 100,000 parts (or pounds) which is equivalent to 10,000 gallons of water, requires about ten pounds of soap to obtain lather. This is equal to 100 pounds per 100,000 gallons. Water obtained from wells in the Prairies contains say 20 parts of carbonate of lime per 100,000 so that the total theoretical consumption of soap will be 2,000 pounds per 100,000 gallons.

Soap is retailed at about 10 cents per pound, therefore one ton of soap will cost about $200, or about $2 for thousand gallons.

We will now consider softening of the water by means of lime. Carbonate of lime $CaCO_3$ is nearly insoluble, but when carbonic acid gas is present soluble bicarbonate of lime is formed. Dr. Clark's process, which has been in operation all the world over, in one form or other, for about half a century, consists of adding quick lime or slaked lime to the water, with the result that the active lime at once combines not only with the excess dissolved carbonic acid in the water and forms the practically insoluble carbonate of lime, but also robs the bicarbonate of lime of its semi-combined carbonic acid, so as to effect practically a total precipitation of all the lime present as carbonate. The active lime thus effects exactly the same result as would be produced by boiling.

In softening water by adding lime, theoretically, 0.56 parts of quick lime is required to remove each one part of carbonate of lime in 100,000 parts of water. In practice, however, more quicklime is required. Adopting the same basis for calculation, as is the case of the soap consumption, each part (or one pound) of carbonate of lime per 100,000 parts (or pounds) which is the same as 100,000 gallons of water, requires 0.56 parts or pounds of quicklime to remove the carbonate of lime. This is equal to 5.6 pounds per 100,000 gallons. The water contains say 20 parts of carbonate of lime per 100,000, so 112 pounds of quicklime are necessary. With lime at one cent per pound, the cost of softening such water is $1.12 per 100,000 gallons, or .12 cents per thousand gallons. The actual cost will probably be nearly twice as much. It will thus be observed that softening by lime is theoretically about 18 times cheaper than by soap.

Prairie water, however, as already stated, contains other salts than carbonate of lime and we will see what it means to adopt a softening process to reduce them to an economical minimum. That will mean the adding of quicklime as well as soda-ash. Assuming that prairie well water contains 20 parts per 100,000 of calcium carbonate, 3 parts per 100,000 of magnesium carbonate, and 15 parts per 100,000 of magnesium sulphate, the quantity of quicklime to remove the calcium carbonate will be the theoretical amount already mentioned:—112 pounds per 100,000 gallons.

The theoretical quantity of soda-ash necessary to remove most of the magnesium carbonate will be 37.6 pounds and to remove the magnesium sulphate 130 pounds per 100,000 gallons.

The cost will be, theoretically, 112 pounds of lime at one cents per pound, $1.12; 167.6 pounds of soda-ash at three cents, $5.03; total, $6.15.

The cost of lime and soda is therefore equal to about six cents per thousand gallons, but in actual practice it will be more. To this must be added the cost of labour, supervision, capital charges, etc. As the cost is high, it is desirable to ascertain to what extent the hardness can be reduced, having regard to our local conditions with respect to cost of labour and materials. But this the author will not follow further at present.

Before any softening scheme can be undertaken with any degree of confidence and satisfaction, it is essential to obtain results of normal analysis of the water to be treated, which is different to sanitary analysis. It must be clearly understood that the foregoing figures are only approximations submitted to illustrate the nature of the problems confronting the engineers in the West.

Before leaving the question of water softening, it will doubtless be interesting to refer to another process, which is now before the public, and that is the Permutit proces. Permutit is the trade name of an artificial zeolyte produced by a process invented by Dr. Gans, of Berlin, Germany. This material is granular in form, much like coarse grey sand. It is usually placed between layers of fine gravel in a filter bed or tank. As the water passes through the permutit, an exchange takes place. The sodium in the permutit exchanges with the calcium and magnesium in the water and by this means the hardness of the water is reduced to zero. When the permutit has lost its power of exchange or in other words it is exhausted, it can be revived by saturating it with a solution of common salt. In this case the sodium in the salt is exchanged for the calcium absorbed by the permutit and when the [illegible] is complete, the filter is washed and is ready for softening a further quantity of hard water.

There are a large number of water softening plants on the market, all worked on the same principle, but differing somewhat in details in the method of proportioning the lime and soda and in the general arrangements. But it will be impossible in the space of this short paper to discuss them. The selection of a plant suitable for Western waters so as to obtain uniform results at as low a cost as possible requires full consideration.

Sterilization

As all waters in the West, are more less liable to pollution it is necessary to adopt some means of sterilization. In this case, there are several ways of sterilizing water, such as by ultra-violet rays, by chlorination, and by ozonation. The most popular method at present of sterilizing is by adding a very small proportion of hypochlorite of lime, often as little as half a pound per 100,000 gallons, or one-half part per million. The quantity of sterilizer required depends, of course, on the quality of the water to be treated.

Filtration

Towns situated near rivers or streams, would seem to be much more fortunate as regards water supply, than those remote from such streams. But it often occurs that the river water is poluted and muddy or both, and the problem is to effectually eliminate the mud or pollution. This is done by means of coagulation, settling basins, filters, etc.

In the West, climate, especially in winter, is rigorous. The temperature at times, falls as low as minus 50 degrees Fahrenheit. Open settling basins and filters are consequently out of the question. They must be covered and this increases the cost considerably, and some means has to be found, by which the cost may be kept at a reasonable minimum. Temperature stresses are often greater than the stresses due to weight of water or earth and as solid masonry possesses elasticity only to a small degree, reinforced concrete would appear to be more suitable for works which are subject to expansion and contraction, due to a great range of temperature. The steel imbedded in the concrete tends to distribute the stresses and prevents concentrated contraction or expansion. The author has observed on an excellently built dam, exposed to a less range of temperature than is experienced in the West, fractures in two or three places from top to bottom, splitting huge masonry blocks. In reinforced concrete structures correctly designed and carefully built, such fractures are not so localised, owing to the greater distribution of stresses by the steel reinforcements.

Settling basins and filters can of course be built in reinforced concrete. It is a question worthy of careful consideration whether rapid mechanical filtration is more suitable and economical for muddy and impure waters drawn from rivers.

Water containing comminuted clay mud is difficult to treat without adding some coagulent. In New Orleans, clay was held in suspension in Mississippi water, after many weeks storage in settling tanks.

At Lorenzo Marques (Delago Bay) water very heavily charged with clay is satisfactorily clarified and purified by means of coagulation and filtration.

Prefilters are adopted in many places especially on the European continent, to remove heavier sediment, and so relieve the ordinary filters of much work and also secure greater purification.

There are some parts of the West, where it is stated to be practically impossible to obtain water. Efforts have been made in some instances to discover water by means of electrical and other devices, and it would be interesting and instructive to know the results.

Having regard to the difficulty of finding an adequate water supply in portions of this province, and its consequent retardent effect on the development of the same, the Dominion Government has had plans prepared for drawing water from the South Saskatchewan River for distribution in the districts in question. In this scheme it is proposed to construct a dam across the river, to generate electrical power for pumping the water through the conduits over the high banks. The Provincial Government also, it is understood, is making investigations into this matter. This action on the part of the governments, only emphasises the points already referred to in this paper with regard to the problems in connection with water supply in the West.

Distribution

The last problem to be discussed in this paper is that of the distribution of water in the towns and cities. It is noticed according to the press, that almost every city in Canada has a problem to solve in respect to the system of distribution mains. This question constitutes an important feature of City Planning, for without City Planning, it is almost impossible to satisfactorily provide for the future. It may seem strange to include the supply of water in City Planning, but it must be remembered that it concerns every thing which will contribute to the material progress and prosperity of a city.

In the West, perhaps more than elsewhere, the growth of the population is so great that it is difficult to extend works of public utility collaterally with the expansion of the city. A village often grows into a town and then into a city in a remarkably short time and it takes its financial resources to provide water, sewers, streets, lights, etc., to all parts of a district, as it is being built upon. But it is not a difficult matter to plan out a town or city ahead of its expansion and design the system of distribution mains and other works so as to be sufficient for a city many times its present size, without incurring undue financial burdens on the present ratepayers. It will doubtless be recognized that it is much more costly to alter and enlarge works, than it is to provide ample dimensions at first, especially in a country where towns increase so rapidly.

The actual facts are, that the authorities generally provide only for the present. Mains are therefore laid from time to time, and these are extended in various directions, without first carefully considering what will be the ultimate result.

This possible development was foreseen by your President when City Commissioner, and his successor, City Commissioner L. A. Thornton, who with the author, submitted a joint report to the Regina City Council recommending a scheme of distribution mains such as will suffice for a much larger city.

It was pointed out in the report that when any water mains were being laid in any part of the city, they should conform as closely as possible to the sizes and directions shown on the plan attached to the report, so that whatever was done would ultimately constitute a part of the complete scheme.

Although engineers have no greater insight into the future than other persons, they can at any rate calculate the probable population in different sections of the city, and design works of adequate capacity, so that when any portion is being carried out from time to time, it will form a part of a satisfactory scheme of distribution.

Doubtless there are many other problems which could with profit be dealt with in this paper, but time and opportunity have not been sufficient; yet it is to be hoped that what is presented will furnish ample topic for criticism and discussion.

Mr. T. P. Howard, of the Phoenix Bridge and Iron Works Limited, has been elected vice-president of the Montreal branch of the Canadian Manufacturers' Association.

The City of Vancouver's Water Supply

Future Extensions Necessary—Water Records—Available Supply—Mileage of Supply Mains—Life of Pipe—Cost Data

THE water supply of the city of Vancouver is derived from two sources, the Capilano and Seymour Creeks, which have drainage areas of about 55 and 80 square miles respectively, emptying into the northerly side of Burrard Inlet at the First and Second Narrows. A complete description of the work to date was published in our issue of December 28, 1910. The summarized and detailed cost data given in that article showed that the total expenditure at that time, exclusive of land purchase, amounted to $399,000.

The engineer on this work, Mr. H. M. Burwell, has very kindly furnished us with an extended description of the whole work, from which we have extracted the following data relating to future extensions necessary for the supply of Greater Vancouver.

Future Extensions Necessary for the Supply of Greater Vancouver

As a result of the writer's report, the Council of 1910 made an examination of the water-fall on Seymour Creek and shortly after purchased the land abutting on the west bank of the Creek at this point, and also secured a record from the Provincial Government for a storage license of 100 cubic feet per second. This Creek is here supplied from high-timbered mountains from 5,000 to 6,000 feet in height. The waterfall is situated four miles above the present intake in use, and offers ideal facilities for the creation of a storage reservoir in the Seymour Creek Valley, and the most suitable intake for all the higher levels of the future Greater Vancouver and adjoining municipalities. The waterfall is formed by a reef of granite rock which crosses the Creek Channel, the crest of which is 632 feet above sea level. By the construction of a concrete dam on top of this rock with a maximum height of 45 feet, there will be flooded an area of 484 acres which it is estimated will give sufficient storage (with the natural flow of the Creek during dry periods in summer or winter) to maintain a supply of about 185 cubic feet per second, or an amount sufficient to cover all of the records granted by the government for this Creek. In addition to its value as a storage reservoir, this large flooded area will form a settling basin that will greatly improve the water during the heavy freshets which occur once or twice each year (extending over a period of three or four days) when the water becomes turbid, and in addition to this will also overcome the winter trouble which sometimes exists, owing to the accumulation of anchor-ice and snow at the intakes. The surveyed pipe line from the old intake up to the waterfall, a distance of four miles, extends along the westerly side of the Creek and with the exception of about 500 feet of sliding bank offers no difficulties in construction. The difficulty of the bank referred to can be overcome by either tunnelling under or cribbing around it.

The survey of the contour line around the flooded area above the proposed dam at the waterfall was run at an elevation of 677 feet above sea level, and extends up-stream from the falls for a distance of about four miles. All the necessary land and right-of-way plans have been prepared, so that the city is now in a position to acquire the necessary land for this important [illegible]

Hastings Reservoir

The City Council a few years ago purchased ten acres of ground, known as the Hastings Reservoir Site. This land lies at an elevation of 340 feet above sea level and is distant about one-third of a mile south of the Second Narrows and one-eighth of a mile east of the east boundary of the city. The site is an ideal one for the construction of a distributing reservoir for the business sections of the city and it is proposed to construct a 20,000,000 gallon reservoir here when the expansion of the city demands that this work shall be gone ahead with. It will be connected with the old Seymour Creek supply main by extending a 30-inch pipe up from the crossing at the Second Narrows, a distance of only about 1,800 feet, provision being made in the construction of the old main for this connection. It is proposed to regulate the pressure throughout the business sections and lower residential levels from this reservoir, which should maintain a pressure about 10 pounds above the present average at the waterworks shops.

36 continuous wood stave pipe, Capilano Creek. Bend, 100 ft. radius.

The following are the daily capacities of different supply pipes under ordinary working conditions where a pressure of 100 lbs. is maintained at the waterworks shops.

	Imperial gals.
Old Capilano System	9,000,000
Old Seymour Main	9,000,000
New 26-in. Capilano Main	4,500,000
New 36-in. Seymour Main	13,500,000
Total	36,000,000

The Municipality of [illegible] gallons and Point Grey 2,200,000 gals., or a total of 6,000,000 [illegible] gals. for city requirements.

Water Records

The following is a list of water records [illegible] controlled by the city.

Capilano Creek .. [illegible] miners inches or [illegible] cu. ft. per sec.
Seymour Creek .. 1400 miners inches or 39 cu. ft. per sec
[illegible] Creek .. [illegible] miners inches or [illegible] cu. ft. per sec.
Seymour Creek .. 150 miners inches or 4 cu. ft. per sec.
Seymour Creek Storage License [illegible] 100 cu. ft. per sec.

Total [illegible]

Available Supply

It will be seen from the foregoing that the total [illegible] this supply at the present time is 192 cubic feet per second, an amount equivalent to about 104,000,000 Imperial gallons a day—sufficient to supply over 1,000,000 inhabitants at 100 gals. per head per day.

When the time arrives to take into consideration the increasing of this supply, it will probably be ascertained that up to a certain limit the most economical development can be made by the utilization of the lakes lying in the Seymour Creek Water Shed above the waterfall.

Mileage of Supply Mains

Capilano System, North Side Burrard Inlet	Miles.
36-in. continuous wood stave pipe	0.75
30-in. continuous wood stave pipe	1.75
30-in. steel rivetted pipe	0.75
22-in. steel rivetted pipe	6.25
16-in. steel rivetted pipe	3.75
26-in. steel rivetted pipe (under construction)	3.75
First Narrows	
12-in. flexible cast iron pipes	1.45
12-in. shore connections (cast iron)	1.35
18-in. flexible cast iron pipes (under construction)	0.70
18-in. shore connections (under construction)	0.30
South Side of Narrows	
22-in. steel rivetted pipe into city	3.75
16-in. steel rivetted pipe into city	3.00
26-in. steel rivetted pipe into city to Little Mt. Reservoir (under construction)	6.25
Seymour System, North Side Burrard Inlet	
36-in. continuous wood stave pipe	0.20
30-in. continuous wood stave pipe	4.15
24-in. lap-welded steel pipe	2.75
36-in. continuous steel rivetted pipe (under constr.)	7.50
Second Narrows	
18-in. flexible cast iron pipes	0.40
18-in. shore connections	0.60
18-in. flexible cast iron pipe (under construction)	0.80
18-in. shore connections (under construction)	3.20
South Side Second Narrows	
24-in. lap-welded steel pipe	2.65
16 and 18-in. lap-welded steel pipe	5.90
24-in. lap-welded pipe (under construction)	4.55
32-in. continuous steel rivetted pipe (under constr.)	3.80
Total length of all supply mains	71.65

Distribution System

The general arrangement of the system is a network of pipes connected together so that the smaller cross mains are fed from both ends, forming a gridiron system. There are in present use about 285 miles of distribution mains ranging from 12 inches down to 4 inches in diameter. The original pipes installed were made of cast iron with the exception of a short section of wooden pipe.

Since the year 1906 owing chiefly to the very large percentage of breakage in shipment of cast iron pipes all pipes purchased, with the exception of a few small C.I. pipes, have been lap-welded steel pipes, made of steel plate sufficiently thick to stand tapping for service connections, without the use of special sleeves or bands.

There are up to date 26,000 services installed, 1,450 hydrants and 1,600 meters, the meters being used only where the supply is given to manufactories or other large consumers.

Cost of Water Works System

1891	Original purchase of Capilano system	$400,000.00
1892	Completion of system	60,000.00
		$500,000.00
1891-1912	City extensions and reservoirs	$2,032,857.82
1906-1912	Capilano extensions	165,641.09
1906-1912	Seymour Creek extensions	1,063,924.30
1906-1912	Submerged mains	138,571.00
	Total cost to end 1912	$3,900,994.21
	Estimate of work in 1913 on City Extensions, Seymour and Capilano extensions	$ 800,000.00
	Estimated cost to end of 1913	4,700,994.21

Life of Steel Pipes

A portion of the original 16-inch steel rivetted supply main from Capilano Creek was recently uncovered on Georgia street where it had been in use for about 22 years. Upon making a careful examination of this pipe it was found to be in a good state of preservation. The only pitting observed was at a few of the field connections, where the paint had been scraped off in order to make the lead joints and through careless workmanship had never been re-painted. Judging from its present state of preservation this pipe will probably last as long again, so that its total life should not be under 45 years. It has a shell of only one-eighth of an inch in thickness, coated with an asphaltum compound, the pipe being dipped into a bath raised to a temperature of from 300 to 350 degrees Fahrenheit. Since the year 1905, the minimum thickness adopted for the shell of steel pipes used in the system is three-sixteenths of an inch. With good coating and proper care in laying the pipes they should last for fifty years under the conditions which exist in Vancouver.

Intake flume and head-gate, Capilano system.

Life of Continuous Wooden Stave Pipe

When the conditions are such as exist in our supply mains, where the pipe throughout its entire length is constantly full of water under pressure, the wood is kept saturated, and if the timber is carefully selected sound fir, free from sapwood, the life of the pipe will be fixed by that of the steel bands. These bands have a diameter of not less than half an inch and if properly coated with paint should last as long as the steel pipe.

Life of Submerged Mains

The life of a flexible cast iron submerged main under the Narrows of Burrard Inlet has proven to be about fifteen years at the First Narrows, owing to the corrosive action of the salt water and the cutting effect of the sand and gravel wash at the mouth of Capilano Creek, carried backward and forward over the pipes by the swift current of the Narrows. As the conditions at the Second Narrows are slightly different there is not sufficient data to form an opinion as to the life of the pipes here.

General

In designing pipe lines a factor of safety of four has been adopted for the strength of pipes against the static pressure in the supply mains, but in some cases this strength has been exceeded where the question of durability and other considerations form important factors. The nature of the soil in which the pipes are embedded, along both Capilano and Seymour Creeks, is chiefly glacial clay, sand, gravel and boulders. Throughout the city it is somewhat similar, except in a few places soft sandstone and hardpan beds are encountered.

Dredging operations have been started at the First Narrows of Burrard Inlet to widen out this channel to improve navigation. It is proposed to widen the channel along the northerly side for a width of about 800 feet with a depth over the dredged area of 30 feet at low water.

The two new 18-in. submerged mains will be placed about 300 feet easterly from the last main hauled, and will cross the newly dredged bottom. After these pipes have been put into use, the six old pipes will then be removed as dredging operations are carried forward over this other section. The renewal of these pipes will be gone ahead with as soon as the dredging is finished, but instead of using 12-inch pipes as formerly it is proposed to use pipes with a diameter of 18 inches.

The supply main along Capilano Creek, with the exception of a short section at each end and a section adjoining the Canyon Tunnel are laid along a public highway, through the municipality of North Vancouver.

The Seymour Creek supply system from the intake down to the Second Narrows, with the exception of a short section at the lower end, extends along a private right-of-way 66 feet in width, with extra land at the intakes and at the Second Narrows, all owned by the city. The chief object of maintaining this as a private right-of-way, is to give the city absolute control over this system at all times, so that the necessary repairs can be made and new mains laid or any other work done without asking the consent of the municipality of North Vancouver or incurring damages that would follow, should this pipe line right-of-way be converted into a public highway.

The Seymour Creek Valley is formed by steep hillsides on each side of the Creek; one or two of them being liable to slides at times. In locating the pipe-line it was thought advisable to keep down as close as possible to the toe of the banks in the more solid ground, to secure the best safety to the pipes, and subsequent experience has proven this to be the only proper location. The protection work done, since the installation of the Capilano and Seymour Creek supply mains, has been chiefly timber, rock-filled cribbing placed along the banks of these creeks to prevent encroachment, due to the alteration from time to time of these channels.

Renewal and Repair Work at Subsequent Mains

Since the waterworks system was first installed, the chief repair work and renewals to the pipe system have been done at the crossing of the First Narrows. There have been four old submerged mains hauled out during the past twenty-four years, making a total of ten which have been installed during this period. There have been numerous repairs and about twelve bad breaks during this time, which have been repaired under water by divers. These breaks were caused chiefly by ships' keels landing on the pipes near the shore ends during foggy weather or when these vessels were out of control.

Management

The waterworks department is controlled by the Water Committee of the City Council and its management is under the direct supervision of the City Engineer with the Waterworks Superintendent in charge of general construction work and maintenance. The accounting is under the supervision of the City Comptroller, and all money required for extensions is borrowed by the issue of city debentures. The receipts from water rates are used to pay the interest and sinking fund of the debentures, together with the operating expenses. The surplus passing into the general revenue of the city.

From the Saskatchewan Capital

Correspondence of tne Contract Record

THE much-talked of money stringency does not seem to have had any great effect on building operations in Regina. Numerous important building projects have been mentioned in the columns of this journal, while the work on hand is sufficient to tax the city's resources to the utmost.

Arrangements are being made for the early construction of the proposed new power house, which will be situated on the banks of the Wascana Lake, and will cost about $125,000.

The Parsons Construction Company have just completed the outside work on the Connaught school, and expect to have the remainder of the work finished in time for occupation by September 1st, the commencement of the fall term. This school will contain 22 rooms and will provide equipment for manual training and domestic science in addition to the regular class-rooms.

Canada Life Building under construction at Regina

The Regina College will erect this year: (a) Two storeys on top of the present college building at a cost of $80,000; (b) A ladies college and residence, funds for which have been provided out of the Massey estate, at a cost of $100,000; (c) A boy's residence to cost $100,000.

The Anglican church also has an ambitious programme on hand, the most important item of which is the St. Chad's College and Synod House. The college will be three storeys and basement high, and will be built of pressed brick and [illegible] [illegible] in the Gothic style of architecture. The main building of the college will be 175 feet by 60 feet. There will also be a chapel, 62 feet by 24 feet. The total cost will be about $100,000. The Synod House will be two stories and basement, built of the same material and same style of architecture as the college. The cost will be about [illegible]

It is expected that construction work will be commenced on the proposed new amouries within the immediate future. The cost of the buildings is to be in the neighbourhood of $250,000. There will be a full-sized basement and the area covered by the entire building will be 145 feet by 275 feet. The construction will be clinker brick. Arrangements will be made for a drill hall, club rooms, store rooms, bowling alleys, shooting galleries, officers' quarters, etc.

Architect Fortin is now busily engaged on the preparation of plans for the new Roman Catholic Bishop's palace, which it is estimated will cost in the neighborhood of $50,000.

One of the best warehouses to be erected in Regina during the present year will be that of the British Columbia Sugar Refinery. The contract for the erection of this building has already been let. It will have ground dimensions of 150 feet by 113 feet and will be of brick construction.

The house problem, which was a very vexatious one at the commencement of the Spring season, has now been practically solved. The private firms doing business in the city have worked together well with this end in view, and the result has been that various firms have erected houses in groups varying from six to one hundred. Plenty of accommodation is now available. The building of dwellings, however, continues to go steadily ahead, in order that the hundreds of newcomers who arrive weekly may be accommodated.

Many high-class dwellings will be erected in Lakeview sub-division this year. Messrs. McCallum, Hill & Company, have sold considerable property fronting on Albert street at $80 per foot frontage. The lots so sold have not had a frontage of less than 80 feet and in some instances 100 feet. It is stipulated that the purchaser in each case erect a dwelling to cost at least $8,000, work on which must commence within two months.

Dr. Andrews has requested the city council to allow him to try his new style of paving, which, according to his statements, costs only a fraction of the cost of ordinary pavement. Dr. Andrews only asks a royalty of one cent per square yard above actual cost price. Arrangements have been made for Dr. Andrews to meet the civic works committee before the contracts for paving are let.

Mayor Martin has been instructed officially by Mr. Donaldson of the G. T. P. Railway Company, that the work of constructing the $1,000,000 hotel "The QuAppelle" will be commenced immediately, the contract having already been let.

Messrs. Howell, Smith & Co. have announced their intention of erecting 50 houses of from six to eight rooms each, in the C. P. R. annex, providing the city will agree to extend the sewer and water mains to serve the property.

Mesrs. Balfour, Broadfoot Company have also announced their intention of erecting a number of high-class dwellings in Belvedere. Work will likely be commenced on them within the course of the next week or two.

Messrs. Fordyce & MacNeil stated that they will erect a $25,000 apartment block in Parliament Heights.

Canadian Railroad Development

Operations will commence shortly on the work of double-tracking the Canadian Pacific Railway line from Islington to Guelph.

Chairman H. L. Drayton, K.C., of the Dominion Railway Commission expects to be able to announce the plans for the viaduct at the next sitting of the commission in Toronto.

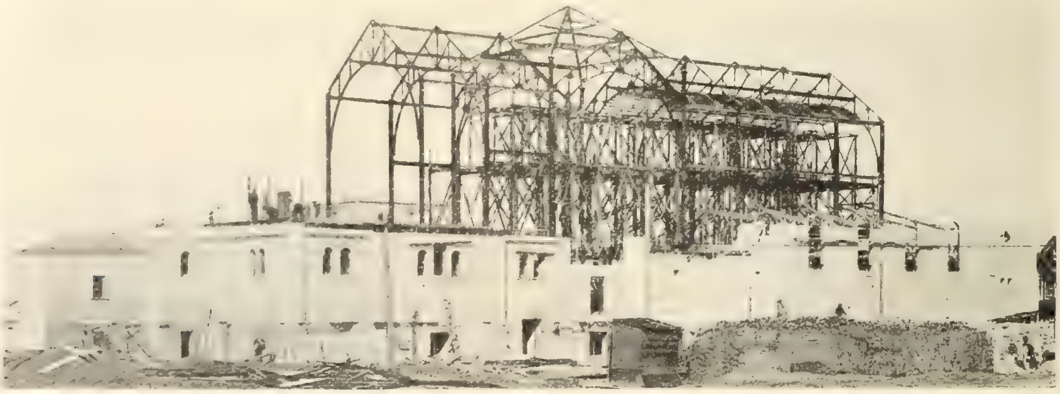
Grading is now being proceeded with on the Galt-Brantford section of the Lake Erie and Northern Railway and it is hoped that this section will be in operation by October 1st next.

The Grand Trunk Pacific Railway are arranging to spend several thousand dollars for road building near Jasper Park, B.C. Trails will also be opened to the spectacular Punch Bowl Falls.

Despatches from the Pacific Coast state that the Canadian Pacific Railway has inaugurated freight terminals at Port Coquitlam, 150 men comprising train and engine crews, and other workers having been removed from Vancouver to that place.

The work of completing the double-tracking of the C. P. R. main line between Montreal and Farnham, P. Q., with the exception of the short stretch over the Lachine canal at Highlands, has been resumed, and it is expected will be finished by December next. The company is carrying out this work itself.

Sir William Mackenzie announced recently that plans for the new line from Toronto to Detroit and Niagara are completed and that active work on construction will be commenced this year. Sir William also stated that before the end of the year the railroad would be connected directly from



Constructional operations in progress on the R. C. Cathedral at Regina.

Toronto to the Rocky Mountains, and that arrangements had been made with the city of Vancouver that the company will inaugurate a fleet of boats on the Pacific Ocean, which will bring direct connections between Vancouver, Port Mann and the Orient.

A despatch from Winnipeg states that Mr. G. J. Bury, vice-president of the C. P. R., has announced that the company has called for tenders for the construction of the tunnel through the Selkirk mountains and part of the double tracking scheme to the coast. Mr. Bury stated that the tunnel would be 5 2/3 miles in length.

Good progress is being made on the big viaduct steel bridge over Boulder Gulch, Grand Trunk Pacific Railway, 20 miles east of Hazelton, and it is expected that it will be completed in the course of a few days. Once this is done, the Grand Trunk Pacific track-laying gangs will be enabled to proceed steadily through to Burns Lake, a distance of 115 miles from the Gulch.

The new C. P. R. bascule bridge across the Kaministiquia River at Fort William was lowered for the first time recently and within a short time the bridge will be opened to traffic, as only the planking and rails have to be laid on the swinging portion before the equilibrium is perfectly adjusted. It is a combination bridge for the handling of both railway and highway traffic, a lower deck with a double track providing for the railway requirements, while on an upper deck there are two street car tracks in addition to a roadway and a footpath on each side.

The new line of the C. P. R. in the west from Bassano, running east through the new town, Empress, and joining the main line at Swift Current, has been started. Over a thousand men, under a score of sub-contractors, have commenced the grading of this line, and when it is completed it will be almost half a day's journey less from Calgary to Winnipeg by the C. P. R. than it is at the present time. A large shipment of 85-lb. rails have arrived from the east and have been stocked in the yards at Bassano. It is expected that fifty miles of the new road will be laid this summer, and that it will be completed by the fall of 1914.

The longest tunnel in the world will be built through Kicking Horse Pass in the Rockies just west of Calgary, this summer, by the Canadian Pacific Railway. The tunnel will be 16 miles long, or four miles longer than the famous Simplon tunnel in the Alps. The eastern portal of the new tunnel will be in Alberta, west of Calgary, and the western portal in British Columbia. Estimates based on the cost of five large Alpine tunnels place the cost of the proposed tunnel at at least $14,000,000, and perhaps $20,000,000. Work will be begun in the near future, but seven years is expected to elapse before the tunnel will be completed.

Good progress is being made on the new C. P. R. million-bushel elevator at Sand Point, St. John, N.B. In the present state of wooden shielding which acts as a mould for the concrete of which the elevator is being built, the structure is about fifty feet high, and the wooden construction work extends the entire length and breadth of the elevator, about two hundred feet by 100 feet, and is ready for its next setting of concrete. The foundation and piers of the first floor have been concreted, and all over the building may be seen gigantic blocks of concrete, reinforced by twisted steel wire, which will hold the immense weight of the elevator superstructure. In all, the building is supported by 91 piers, which vary in thickness according to their place and to the stress to which they will be subjected.

The North Railway Company has five location parties in the field, and it is expected that the surveys will be sufficiently well advanced for tenders to be invited by the middle of June for at least 200 miles between Montreal and the Transcontinental line. It is hoped to have the southern section under contract by Dominion Day, as the contract will call for the completion of the line (which is to be used by the Grand Trunk Pacific as a branch line into Montreal) by the end of 1914. The survey parties are now operating from Bell River south, from Manawaki northward and south, and from Lachute in a north-westerly direction. The surveyors' notes indicate so far that a better route will be secured over the Laurentides than they expected and as far as the other sections are concerned construction will be comparatively easy. The difficult work on the whole line from Montreal to the mouth of the River Nottaway will not be over fifty miles in extent.

Mainly Constructional

The News in Brief—From Coast to Coast

Calgary's building permits for April amounted to $1,560,430.

Work was started recently on the dredging of False Creek, B.C.

A new Y. W. C. A. building is proposed for Hamilton, Ont., to cost $70,000.

The work of excavation has started on the new Technical School, Toronto.

Work is being rushed on the new school at Wilkie, Sask., which, when completed, will cost $75,000.

It has been reported that a new three-storey post office building is to be erected at London, Ont.

Esquimalt, B.C. is considering the installation of a sewage system to cost in the neighbourhood of $500,000.

The waterworks plant, which is being installed at Medicine Hat, is expected to be ready for operation by July 15.

Plans have been submitted to the city council for the new central police station at Edmonton. The estimated cost is $175,000.

The Canadian Domestic Engineering Company, Limited, have opened a branch office at Alfred Building, Portage Avenue, Winnipeg.

For the fiscal half year just ended the building permits issued by the Westmount City Council, P.Q., totalled over half a million dollars in value.

The city of Hamilton, Ont., just held its record month for building permits, the total for April amounting to $1,250,000.

The approximate cost of contracts awarded for public works at Edmonton for the first four months of this year amounts to $5,620,000.

Good progress is being made with colonization road work in Northern Ontario. The Sudbury road, which was commenced in 1907, will be completed this fall.

The York, Ont., Highways Commission are considering the establishment of oil depots at convenient points in the good roads district. Six thousand-gallon tanks will be built.

Work is to be started immediately on the million-dollar building for the Methodist Book Room at Toronto. The ultimate height will be ten storeys, but only six will be completed at the first.

The Saanich, B.C., Council are considering the erection of a mausoleum and crematorium to cost $200,000. The building would be of the most modern type, similar to that at Toronto and elsewhere.

Examinations for admission to the study of architecture or registration in the province of Quebec will be held on July 11 and following days at the rooms of the Province of Quebec Association of Architects, Quebec.

The London Pressed Brick and Tile Company, Limited, London, Ont., incorporated recently, have purchased the machinery for their plant which will be installed early in July. Their capacity will be 22,000 brick a day.

With a view to increasing the facilities for hauling freight in Montreal, the Board of Control have been asked to look into the question of renewing the temporary privilege for carrying freight granted to the Tramways Company. There has been for a long time a shortage of carters in the city.

New Building for Canadian Fairbanks-Morse Company

Following out the policy of erecting new buildings to meet their increasing business, the directors of the Canadian Fairbanks-Morse Company, Limited, have decided to construct a new office building in Montreal, which will be the head office of the company. Last year the company erected a very finely equipped plant for the manufacture of tractors in Toronto, and they are now erecting in Vancouver a new warehouse and office building. The Montreal office will be at the southeast corner of St. Antoine and St. Cecile streets, frontage on the former thoroughfare being 93 feet 5 inches, and on the latter, 144 feet 5 inches. The plans provide for seven floors and a basement, to be constructed of reinforced concrete with brick facings and terra cotta. On the ground and first floors will be situated the offices and sample rooms, in addition to a retail sales department. The third floor will be occupied by the head office staff, advertising, purchasing and freight departments, while the fourth, fifth and sixth floors will be used for the storage of goods, and the seventh floor equipped for a repair shop. By this arrangement the separate warehouse for storing goods will be done away with, and practically the complete Montreal house business of the company will be carried on under one roof.

Shipping will be done from the basement floor at the rear, and provision has been made so that a five-ton truck can enter the basement. In the front there will be a demonstrating room where the company will show their gasoline engines, pumps, etc., in operation. Two high speed freight elevators and one passenger elevator will be installed. There will be from 12 to 15 separate telephone lines with two switchboard operators, and an internal telephone system will be fitted. The building was designed by T. Pringle & Son, Limited, Montreal, and the contractor is Mr. E. G. M. Cape, Montreal.

THE CANADIAN FAIRBANKS-MORSE CO
THE CANADIAN FAIRBANKS MORSE CO

Proposed new building for Canadian Fairbanks-Morse Company.

Non-Freezing and Fumeless High Explosives

To contractors and others interested in blasting and excavation work, some information concerning the products of Dominion Explosives, Limited, 75 Sparks street, Ottawa, will be interesting and profitable.

The claims made by the company for these high explosives are that—they do not freeze; produce no noxious fumes; contain no nitro-glycerine, chlorate of potash, picric acid, or gun-cotton; can be stored, handled and used with greater convenience and safety, and with less expense than other high explosives, and can be stored, in any dry, ventilated building, indefinitely without deteriorating from age; will do all kinds of blasting work that can be done with nitro-glycerin dynamite or other kinds of powerful high explosives; insure greater safety to both life and property wherever adopted for use in place of nitro-glycerine, dynamite or other highly-sensitive high explosives.

The company carry in stock a full line of blasting accessories, including blasting caps, electric exploders, fuse, circuit testers, cap crimpers, electric firing machines, leading and connecting wire, etc.

Readers of the Contract Record are advised to communicate directly with Dominion Explosives, Limited, in regard to information and quotations.

Slow progress is being made with the construction of the Montreal filtration plant at Verdun. During the winter the concrete beds were damaged by frost and this will have to be made good by the contractor. The contract calls for the completion of the work by September 1st of this year, but, according to Mr. Godfrey, one of the City Controllers, it is very unlikely that the work will be finished by that date.

The construction of large dry docks at Halifax, Quebec and Esquimalt will, it is said, form part of the government's programme for the development of Canadian ports and Canadian shipping. The necessary legislation for the building of these dry docks may be introduced during the present session. The intention is that these dry docks will be large enough to accommodate any warship of the British Navy.

A new hotel, containing about 600 rooms, is to be erected on the site of St. George's Church, Dominion Square, Montreal. The syndicate, which includes New York capitalists, will not obtain possession of the property for a year, but in the meantime plans, specifications and contracts will be ready, so that as soon as possession is obtained the work will be proceeded with. Messrs. Ross & MacDonald, Montreal, are the architects.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Bowmanville, Ont.

Sewage disposal works. Tenders received by Clerk, John Lyle, up to May 30th. Plans and specifications at Town Hall and at office of Engineers, Messrs. Chipman & Power, Mail Building, Toronto. Mayor, S. C. Hillier.

Chatham, Ont.

Granolithic walks will be laid on St. Clair, Selkirk, Emma, Queen, Elm, Lowe, Pine, St. Patrick, Florence and 4th streets and also on Grand Patterson, Spencer and Gladstone avenues. Chairman Board of Works, Ald. Houston.

Hull, Que.

Sewer, cost $12,000, Queen. Mayor, Dupuis. Engineer-in-charge, J. A. Laforest. By-law will be submitted to ratepayers June 2nd.

Montreal, Que.

Municipal improvements, cost $533,545, planned. Engineer, Geo. Janin, City Hall. The Board of Control has submitted estimates for roads, fire department, markets, etc. Supplies will be required, such as street cleaners, cement and wood for sidewalks.

Oshawa, Ont.

Sidewalks. Tenders received by Engineer, Frank Chappell, up to noon May 31st, for 25,000 sq. ft. more or less of cement concrete sidewalks. Specifications at office of Engineer.

Rodney, Ont.

Council plans to make a number of improvements to roadways and lay new cement walks. Clerk, Jno. H. Shaw. Engineer-in-charge, Levi Miller.

Sandwich, Ont.

Work has been ordered on a new concrete pavement for Bedford street, and council plans to lay others on Sunset and Soper avenues.

Sorel, Que.

City is preparing to resume paving with macadam, of its 2 main streets, work was started last fall. Work done by City—day labor.

Tilbury, Ont.

Council plans to pave Market Lane and Carlyle avenue. Selection of material to be made later. Clerk, W. A. Hutton.

Toronto, Ont.

Sewage Station, Etc. (New Barracks Property at Long Branch). Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Engineers, Chipman & Power, Mail Bldg., Toronto. Separate tenders received by Secretary until June 23rd. Plans, etc., at office of Secretary and Engineers. (2) Sewer pipe laying. (7) Sewage pumping station. (8) Sewage disposal works.

Waterworks, etc. (New Barracks property at Long Branch). Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Engineers, Chipman & Power, Mail Building, Toronto. Separate tenders for each item received by Secretary until June 23. Plans, etc., at office of Secretary and Engineers. (1) Waterworks pipe laying. (3) Pump house, Filter House and Reservoir. (4) Foundation for water tower. (5) Steel water tower and supports. (6) Waterworks intake pipe and wells.

CONTRACTS AWARDED

Bowmanville, Ont.

Machinery for pump house, cost $4,680. Clerk, John Lyle. Engineers, Chipman & Power, Mail Building, Toronto. General contractors, Canada Foundry Company, Limited, King and Simcoe streets, Toronto.

Kincardine, Ont.

Waterworks pump, for town council (Waterworks Commrs.). Chairman Commrs., Ex.-Mayor Patterson. Contract for 100 gal. pump awarded to Martin Pump & Machine Co., Davies and Matilda streets, Toronto.

Regina, Sask.

Waterworks supplies. Supt. of Waterworks, J. M. Mackay. Contract B.—Canadian Iron Corporation, 1000 Talbot street east, St. Thomas, Ont. Contract C.—Jas. Robertson & Co., 176 Pacific avenue, Winnipeg. Contract C.—Pig lead, J. A. Ashdowne Co., Bannatyne avenue east, Winnipeg. Contract D.—Drummond McCall Co., Ltd., 23 Victoria square, Montreal.

St. John

Watermain, Prospect and Mt. Pleasant avenues. Commr., R. Wigmore. Engineer, Geo. Hatfield, City Hall, St. John, N. B. Work being done by day labor.

Winnipeg, Man.

Lead pipe for Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James avenue. For 80,000 lbs. ½ in. in 145 ft. x 150 ft. lengths; 60,000 lbs. [illegible] in. in 150 ft. x 190 ft. lengths, 4,000 lbs 1 in. in 170 ft. lengths. Contract to be awarded equally between the James Robertson Co., Ltd., 176 Pacific avenue, and The Canada Metal Co., Ltd., Chambers street. Both tenders being, $5.85 per 100 lbs.

Concrete mixer. Engineer, H. N. Ruttan, 223 James avenue. Contract awarded to Canada Foundry Co., Ltd., 146 Notre Dame street east, for 1½ cu. yd capacity, concrete mixer, for asphalt plant, at $1,690.00. M. Peterson, Sec. Board of Control.

Sewer and water main extension for Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James ave. Contract awarded to J. W. Astley, Engineer of Construction, City yards, for sewer in Elm street from Godfrey to Coluhoun at $1,841, and in Godfrey from old to new city limits, $585. Water main in Elm street from Godfrey avenue to Colquhoun avenue, $993.20.

Water meters for Board of Control. Sec., M. Peterson. Contract awarded to The National Meter Co., Chicago, for supply of Empire meters at the price of $11.75 each for ½ in. meters and $29.25 each for 1 in. meters.

Meter fittings for Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James avenue. Contract awarded to Crane & Ordway Co., 93 Lombard street, for galvanized meter fittings.

Railroads, Bridges and Wharves

Algoma Dist., Ont.

C. N. O. Rly. Co. has been authorized to construct a bridge over Missinaibi River at mileage 522.5 from Sudbury Junction.

Aldborough Twp., Ont.

Improvements to drains and bridges, cost $20,000, contemplated by the Twp. Council. Reeve, P. A. McVicar, West Lorne, Ont. Engineer-in-charge, G. A. McCubbin, West Lorne.

Caledonia, Ont.

G. T. Rly. Co. contemplate erection of freight sheds here. Head office, Montreal.

Hamilton, Ont.

T. H. & B. Rly Co. has been authorized to construct spur into premises of Sawyer-Massey Co., Ltd., Hamilton, and also into lands of Flurnivall-New, Ltd., and Henry New Estate in south-west part of city.

Kendal, Sask.

Canadian Northern Railway Company has been directed to erect station at Kendal, Sask., extended platform to a length of 260 ft. and construct walk to connect with walk constructed by town.

Province of British Columbia

Esquimalt & Nanaimo Railway Company has been authorized to construct Bridge No. 24.04 across Cooks Creek (South Fork) on its Comox extension B. C.

Duffield, Alta.

Grand Trunk Pacific Railway Company's proposed location of station at Duffield at mileage 831.3 Alexia Stoney Indian Reserve No. 133a & B. Dist. North Alta has been approved.

Paris, Ont.

Lake Erie & Northern Railway Company has been authorized to construct subway under tracks of G. T. R. at Paris.

Province of Manitoba

[illegible]

construct bridges Nos. 14.1, 17.7 and 9.6 on Brandon subdivision.

Province of Ontario
Grand Trunk Railway Company has been authorized to reconstruct bridge No. [illegible] at mileage 46.80 on 14th District, Hamilton Div., Ont.

Quebec, Que.
Dry dock, Lauzon, for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until June 23rd. Plans, at office of C. E. W. Dodwell, Halifax, N.S., J. K. Scamwell, St. John, N.B., Chas. Chapias, P.O. Quebec City, J. L. Michaud, P.O. Montreal, J. G. Sing, Toronto, H. J. Lamb, Windsor, Ont., W. Z. Earle, Ashdowne Building, Winnipeg, and Postmaster, Lauzon.

Skeena City, B.C.
Grand Trunk Pacific Railway Company's location of Skeenan City, mileage 32.8 Prince Rupert East in lot 188, Rge. 5 Coast District, B. C., has been approved.

Streetsville Jct., Ont.
Canadian Pacific Railway Company has been authorized to construct bridge No. 22.2 at Streetsville Jct.

Toronto, Ont.
Bridges or Viaducts (New Barracks, Property at Long Branch). Dominion Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Engineers, Chipman & Power, Mail Bldg., Toronto. Tenders received by Secretary until June 23rd. Plans, etc., at office of Secretary and Engineers. (9) Bridges or viaducts.

Canadian Pacific Railway Company has been authorized to construct bridge No. 4.9 on Toronto Sub-division, Ont., near Norwood station, and No. 50.9 on Havelock Sub-division, Ont. Div., near Ardendale station.

Four bridges planned for York Highways Commission. Chairman, J. J. Ward, 57 Adelaide east. Two between Markham and Unionville and 2 on 6th concession of Markham. Probably concrete construction.

CONTRACTS AWARDED

Fort William, Ont.
Car shop extension, cost $9,000, for C. P. R. Architect, owner. General contractor, J. H. Simmons, Winnipeg, Man. 16 x 50, cement foundation, frame construction, felt and gravel roofing.

Winnipeg, Man.
Piers for bridge, Osborne street, for Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James avenue. Contract awarded to S. K. Karper, 527 Notre Dame avenue, for sum of $825.

Public Buildings, Churches, Schools, etc.

Acton, Ont.
Addition to school, cost $6,500, planned. Clerk, A. J. MacKinnon. Three-room addition to Public School. By-law carried.

Assiniboia, Sask.
School, cost $40,000, for School Dist., Assiniboia. Three storeys, 8 room school. Plans being prepared.

Belleville, Ont.
Alterations and addition to boiler house, for Prov. Govt. Dept. of Public Works. Sec., H. F. McNaughton, Toronto. Tenders for alterations to boiler house and steam plant at Deaf and Dumb Institution. Tenders received by Secretary, until May 23rd.

Calgary, Alta.
School, cost $165,000, Crescent Heights. 18 rooms. Tenders will be called about May 20th, 1913.

Farnham, Que.
Church, contemplated for St. James Episcopal Congregation, c/o Mr. Boright, Farnham, Que. Plans will be prepared.

Fort William, Ont.
Picture theatre, cost $12,000, Simpson, for Kasler & Leff, Simpson street. Plans ready.

Halifax, N.S.
School. Tenders received by S. J. Wilson, Secretary School Commissioners, until June 2, for all trades, including heating, ventilating and electric wiring. Plans, etc., at office of W. J. Busch, 60 Bedford Row. Cheque for 5 per cent. to accompany each tender. Names of sub-contractors must be stated.

Macleod, Alta.
Town hall, for town council. Sec.-Treas., E. F. Brown. Architects, Hodgson, Bates & Beattie, Grain Exchange, Calgary. Tenders have not been called for yet.

Ottawa, Ont.
Elevator enclosure, for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until May 28th for elevator, etc., in West Block. Plans, etc., at his office.

Perrytown, Ont.
Church for Anglican Congregation. Pastor, Rev. E. Morris, Campbellcroft. Tenders received by E. Wilson, Perrytown. Stone construction, stone foundation.

Petrolia, Ont.
Armouries, cost $25,000, for Dom. Govt. Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa. Two stys., pressed brick construction. Plans being prepared.

Sandwich, Ont.
Club house, cost $25,000, for Essex County Golf and Country Club. Sec.-Treas., A. J. Wilkinson, Windsor. Plans ready.

Sorel, Que.
Addition to hospital for General Hospital Board (Grey Nuns). Money has been donated for construction of an aisle to present building.

Stratford, Ont.
Theatre, cost $10,000, Ontario street, for Wm. Gordon, Albion Hotel. Architect, J. S. Russell, 21 Downie street. One-storey, 40 x 116, brick.

Sussex, N.B.
Armory, for Dom. Government Department of Public Works. Secretary, R. C. Desrochers, Ottawa. Work to start this summer. 106 x 72, stone facings, brick construction.

Toronto, Ont.
School. Tenders received until June 9 for erection of eleven-room building. Cheque for 10 per cent. must accompany each tender. Plans, etc., at office of Ellis & Connery, architects, Manning Chambers. B. Mallory, chairman Sites, Building and Repairs.

Schools. Tenders received until May 30 for enlargement of Balmy Beach School, Pine ave., Lansdowne School, Spadina Cres.; Frankland School, and for midsummer repairs, including cabinet work. Cheque for 5 per cent. of amount of tender, must accompany each. Specifications, etc., at office of Superintendent of Buildings, City Hall. W. O. McTaggart, Chairman of Committee; W. C. Wilkinson, Secretary-Treasurer.

Barracks. Tenders received until June 24 for construction of men's block, new barracks, Long Branch. Plans, etc., at office of Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto and Department of Public Works, Ottawa. Cheque for 10 per cent. payable to Hon. Minister of Public Works, must accompany each tender. R. C. Desrochers, Secretary, Ottawa.

Addition to fire protection, cost $14,000, Toronto Island. Mayor, H. C. Hocken. Fire Chief recommends 60 additional hydrants with 300 ft. hose for each. Recommendation carried by Property Committee.

Vancouver, B.C.
Tenders received until June 16 for construction of a wooden lighthouse and dwelling combined, a boathouse and an oil shed at Addenbrooke Island, Fitzhugh Sound, B.C. Plans, etc., at Dept. of Marine & Fisheries, Ottawa. Address A. Johnston, Deputy Minister. Plans also at post offices at Prince Rupert, Vancouver, Nanaimo, Alberni and New Westminster.

Windsor, Ont.
Oddfellows temple, cost $27,000, Wyandotte, for I.O.O.F. Lodge, Windsor. Three storeys, 90 x 50, brick and structural steel construction. Plans being prepared.

Church, cost $7,000, contemplated. Chairman Church Board, O. E. Fleming. Architect, Harold Barrons is preparing sketches. Two storeys, 42 x 50, brick and tile construction.

CONTRACTS AWARDED

Brantford, Ont.
Theatre, cost $20,000, Dalhousie street, for James O'Rielly, American Hotel. Architect, J. R. White, Arcade Bldg., Niagara Falls, N.Y. General contractor, Chas. Van Dusen, Scotland, Ont. Three storeys, 128 x 58.

Calgary, Alta.
Hospital, for Hospital Board. Architect, J. J. O'Hard. General contractors, Doyle, Thomas and Christieneen, Elma Block, Calgary. Heating and plumbing, Grant Bros., 2nd street west. Electric, Cunningham Electric Company, 2nd st. west. Four storeys, 85 x 42, cement foundation, brick construction.

Edmonton, Alta.
School, cost $9,000, 2nd Ave north. Architect, J. Turner, Mortlake Block. General contractor, O. J. Edinger, 45 Whyte avenue. Two storeys, 31 x 34, brick foundation, frame construction.

Fort William, Ont.
Picture theatre, cost $15,000, Simpson, for Ben Ross, Corona Theatre. Architects, Carson & Smithley. The contract for the erection of above theatre has been switched to Alberta Land Com-

pany, Port Arthur. Marsh & Powers, Engineers for above Company.

Grey Twp., Ont.
Church, cost $6,000, for Union Methodist Congregation. General contractor, Wm. Eizerman, Mitchell. White and pressed brick construction, stone and cement foundation.

Hamilton, Ont.
Alterations to school, cost $65,000, Barton street. Secretary, R. H. Foster. Architects, Stewart & Witton, H. P. and L. Building. General contractor, W. H. Cooper, 67 York street. 12-room addition.

Addition to St. Anne's R. C. church, cost $3,000. Architect, Robt. Clohecy, 226 John street south. General contractors, T. J. Drake, 49 Earl street. Cement block addition.

Montreal, Que.
Church, Rosemount, for Presbyterian Institute, Montreal. Architects, MacVicar & Heriot, 104 Union avenue. Mason, Peel & Peel, 10 Fullum. Structural steel, National Bridge Co., 317 Transportation Building. Roofing, Sibley & Huot, 77 Duke street. Plastering, R. D. Clark & Sons, 26 Lincoln avenue. Structural steel construction.

Quebec, Que.
Addition and alterations to drill hall for Dom. Government Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Jinchoreau & Lalonde, Que.

Regina, Sask.
Incinerator, cost $64,000, for city council. Clerk, A. W. Pool. Engineer, J. W. Bertwistle. General contractors, The Decarie Incinerator Company, 345 McKnight Bldg., Minneapolis, Minn. For supplying and building new incinerator and removal of old one.

St. John, N.B.
Sunday school building, cost $40,000, Germain street, for Germain street United Baptist Church. Pastor, F. S. Porter, Queen street. Architect, F. Neil Brodie, 42 Princess street. Carpenter, S. A. Williams, Prince William street. Painting, G. R. Craigie, 51 Harrison st.

Thedford, Ont.
Church for Methodist Congregation. Pastor, L. W. Reid. General contractor, R. Moore, Warwick. Carpenter, W. Marks & D. Elson, Parkhill. One sty. and basement, cement block construction.

Yellow Grass, Sask.
School, cost $30,000, for town council. Clerk, P. A. Jones. Architect, Geo. Janot, Weyburn. General contractor, E. E. Poole, Roleau. Two storeys and basement, 36 x 50, stone and cement foundation, structural steel and Man. limestone construction.

Business Buildings and Industrial Plants

Brampton, Ont.
Gasoline engine factory for Massey-Harris Co., 915 King St. W., Toronto. Site has been purchased and plans are being prepared.

Plant, Queen street, for Hough Lithographing Co., Ltd., 96-104 Spadina ave., Toronto. Building has been purchased and will be remodelled, to be run by hydro-electric power.

Brantford, Ont.
Alterations to boiler house for Provincial Government, Dept. of Public Works. Tenders for alterations to boiler house and steam plant at Institution for Blind. Tenders received by Secretary, H. F. McNaughton, Toronto, until May 23rd.

Calgary, Alta.
Business building for the Flesher Marble & Tile Co., 3 Bruner Block. Architect, R. B. Whitten, 501 Beveridge Blk. Plans prepared.

Bank, cost $80,000, for the Merchants Bank of Canada. Architects, Brown & Vallance, 32 Canada Life Bldg., Montreal. Three storeys, 98 x 76, concrete foundation, structural steel. Tenders will be received by architects about May 17th to the 24th.

Cudworth, Sask.
Stores, cost $6,000, for the Canadian City & Town Properties, 282 Main St., Winnipeg. Architect, H. E. Lloyd-Owen, Hammond Bldg., Moose Jaw, Sask. One storey, 50 x 50.

Fredericton, N.B.
Searle & Lamson Ltd., King St., are asking for estimate on refrigeration and cold storage plant. Proposed building 90 x 30, cement construction throughout.

Hamilton, Ont.
Addition to store, James street south, for Geo. W. Robinson, James St. South. Architects, Mills & Hutton, Bank of Hamilton Bldg. Two storeys, plans prepared.

Ottawa, Ont.
Printing plant, cost $8,000, George, for Miss F. W. Evans. Agent, N. D. Torter, 109 Bank street. 34 x 99, solid brick construction, cement foundation. Plans in progress.

Factory, Nelson St., for Crown Lithographing Co., Wellington St. New building and plant contemplated.

Storehouse, cost $25,000, Cooper St., for Ottawa Dairy Co. Manager, Mr. Bingham, Somerset street. Solid brick construction, cement foundation. Plans drawn.

Pathlow, Sask.
McEwen & Dawson will erect grain elevator this year.

Regina, Sask.
Stores and apartments, cost $25,000, for Boyd Bros. Three storeys, brick and stone construction. Plans in progress.

St. John, N.B.
Factory for Molassive Co., Ltd., Greenwich, London, Eng., c/o L. C. Prime, St. John, N.B. (17 S. Wharf). Plans being prepared.

Warehouse, Marsh Rd., for Arthur Likely, 99 Marsh Rd. Architect, H. C. Mott, Germain street. Two storeys, 25 x 100, frame construction. Plans ready.

Sault Ste. Marie, Ont.
Store and residence, cost $10,000, Queen street, for F. E. Crawford. Two storeys, 27½ x 80, pressed brick front, stone construction. Plans being prepared.

Taber, Alta.
The Harkness Flour Milling Co., Carman, Man., contemplated erecting a mill to have capacity of 200 bbls. per day.

Toronto, Ont.
Factory contemplated, Sorauren, for J. M. Loose & Sons, Carlaw ave. Site purchased, 250 x 134. This firm manufactures piano actions, etc.

Alterations to hotel, cost $5,000, for Gibson Hotel Co., Queen & George. Architects, Langley & Howland, Continental Life Bldg. One storey, 25 x 40, brick construction. Plans drawn.

Factory, cost $8,000, Adelaide street, for Littlejohn & Vaughan, 79 Adelaide W. Architect, C. J. Gibson, 75 Yonge street. Two storeys, 28 x 45, brick and structural steel construction. Plans ready.

Warehouse, 433-5 King street, for Samuel Benjamin Co., King & Spadina ave. Tenders received by architects, Burke, Horwood & White, 28 Toronto street. Seven storeys, structural steel, stone and brick construction. Excavation finished.

Wyoming, Ont.
Cannery, cost $15,000, for W. Nelson, c/o Dr. Kidd. Plans being prepared.

CONTRACTS AWARDED

Calgary, Alta.
Stores and offices, cost $6,000, for MacKay & Dipple, 218 8th ave. west. Architect, P. L. Logan, c/o Alliance Investment Co., Ltd. General contractors, Johnston & Johnston, 125 Travis Block. Two storeys, 65 x 125, cement foundation, brick construction.

Cottam, Ont.
Cannery for Cottam Canning Co. General contractor, W. J. Wyatt. Two buildings, two storeys, 40 x 100, cement construction and foundation.

Edmonton, Alta.
Warehouse, cost $26,000, 9th street, for McJannel & Rae, 102 Jasper East, Edmonton. General contractors, Read McDonald & Brewston, 619 4th street, Edmonton. Three storeys, 97 x 120, cement and concrete foundation, brick veneer construction.

Stores and offices, cost $12,000, Jasper E. Architect and general contractor, P. McNaughton, 631 Elizabeth street. 3-storeys, 58 x 60, concrete foundation, frame construction. Excavating started.

Fort William, Ont.
Bank, cost $40,000, Victoria, for Merchants Bank. Architect, Carl Wirth. General contractors, Seaman & Penniman.

Elevator addition, cost $400,000, River Front, for Western Terminal Elevator Co. General contractors, Burrell Engineering Construction Co., Chicago, Ill.

Hamilton, Ont.
Store and apartments, cost $4,000, for J. Will, Central and Prospect avenues. General contractors, Mills Bros., 158 Balmoral ave. Brick construction, concrete foundation.

Addition to factory, cost $5,000, Barton E., for Malcolm, Souter Furniture Co., Barton St. E. Architects, Stewart & Witton, H. P. & L. Bldg. General contractors, Mitchell & [illegible], [illegible] Peter street. Two storeys and basement, 28 x 71, brick construction.

London, Ont.
Brick plant, cost $100,000, for London Pressed Brick & Tile Co., Robinson Hall Chambers, London. Manager, [illegible]

[illegible] Front and Bathurst Sts., Toronto.

Melfort, Sask.

Stores, cost [illegible], Sidney Smart, Melfort, Sask., general contractor and owner. 80 x 100, cement foundation, brick construction.

Montreal, Que.

Stores and residences, cost $15,000, Ontario St., Maisonneuve. Builder and owner, [illegible], 1150 Ontario Street. [illegible]. Two storeys, 48 x 80.

Lumber factory, cost $9,500, Outremont (Rockland), for Warren Bros. Co., [illegible]. Two storeys, 52 x 112, brick, concrete foundation. Owner will call for electric tenders later. Work done by day labor. Excavating started.

Newcastle, N.B.

Alterations and additions to factory for the Canadian Gear Works Ltd., Newcastle, N.B. General contractor, P. A. Forsyth, Newcastle, N.B. Will manufacture wagon gears and bodies. Part of plant will be a planing mill.

Ottawa, Ont.

Store, cost $4,500, Gloucester, for Mrs. Mary Stuart, 178 1st ave. General contractor, Thos. Stuart, 178 1st ave. Solid brick construction.

Garage, cost $5,000, McLaren. General contractor and owner, H. Robertson, 150 McLaren. 26 x 36, solid brick construction.

Peterboro, Ont.

The contract for the steel work on the new plant of Henry Hope & Son at Peterborough, has been awarded to the Hamilton Bridge Co., and for the masonry and excavation to R. Sheehy, of Peterborough. The new plant will be devoted to the manufacture of steel sash.

Regina, Sask.

Warehouse, cost $20,000, for British Columbia Sugar Refinery Co., Ltd., 997 Powell street, Vancouver. General contractors, Smith Bros. & Wilson, Regina, structural steel and concrete and pressed brick construction.

Warehouse, cost $8,000, for A. W. McGregor, Darke Bldg. Two storeys, brick and stone construction. Work done by day labor.

St. John, N.B.

Garage, Duke St. Builder and owner, Edward Bates, 73 Duke street, St. John, N.B. One storey, 40 x 140, concrete foundation, stock brick construction.

Thorold, Ont.

Factory, cost $150,000, for Beaver Board Co., Military Rd., Buffalo, N.Y. President, W. F. MacGlashan. Architect, private. General contractors, Morris & Allan, Builders Exchange, Buffalo, N.Y. Two storeys, reinforced concrete.

Toronto, Ont.

Four stores and theatre, cost $21,000, Danforth ave., for A. E. Playter, 28 Playter Cres. Architects and builders, Wilkins & Edwards, 56 Globe. Three storeys, 100 x 120, structural steel and brick construction, stone foundation.

Factory, cost $9,500, Queen E. Owner and builder, H. L. Todd, 421 Queen E. Two storeys, 45 x 178, brick construction and foundation.

Store and residence, cost $3,200, Eglinton, for T. Fewster, 27 Eglinton ave. Builder, E. C. Hurlburt, 44 Castlefield Rd. Two storeys, 19 x 50, brick construction.

Alterations to office building, 164-6 King, for Enoch Thompson (in trust), 152 Bay street. General contractors, the Building & Construction Co., 26 Adelaide W.

Wallaceburg, Ont.

Machine shop, cost $3,800. Builder & owner, R. A. Home, Elizabeth street. One storey, 40 x 75, white brick construction. Equipment required.

Residences

Caledonia, Ont.

Row of residences for the Caledonia Milling Co. Manager, Hugh Scott. Plans being prepared.

Residence, cost $4,500, for H. B. Sawle, c/o the Sachem Office. Architect, Jno. Walker, New York and Caledonia. Two storeys, bungalow style, 38 x 26, frame, stone and cement foundation. Plans prepared.

Montreal, Que.

Four residences, cost $50,000, for Damien Boileau, 334 Chambord street. 2½ storeys, 30 x 140, solid brick construction, stone foundation, hardwood floors, gas and electric lighting, hot water heating, mantels. Owner will receive tenders from June 1st to June 8th.

Six residences, cost $10,000, for A. Cossette, 2470 St. Urbain. Designer, J. E. Lafond, 2614 Esplanade ave., will call private tenders for foundation and brick work this week and other trades later. Work just started. Three storeys, 90 x 50, brick construction.

Ottawa, Ont.

Residence, cost $6,000, MacLaren, for Mrs. E. Martin, 550 MacLaren. 44 x 36, 32 x 16, brick construction. Plans being prepared.

Residence, cost $4,500, Hopewell, for Jos. Dale, 1235 Bank street. 2½ stys., 22 x 28 and 14 x 10, brick construction. Plans being prepared.

Residence, cost $4,000, Bayswater, for W. O. Millar, 1072 Somerset. 2½ stys., 24 x 34, brick construction. Plans prepared.

Regina, Sask.

Apartments, cost $25,000, contemplated for Fordyce & McNeil, 1753 Hamilton street. Brick construction. Plans in progress.

St. John, N.B.

Apartment house, cost $11,000, contemplated for G. Gray Murdock, 277 Douglas ave. Architect, F. Neil Brodie, 42 Princess street. Two storeys, 45 x 58. Owner has not decided when he will build on account of high cost of material.

House, two apartments, cost $9,000, Cradle Hill, for Miss Louise Parks, 62 Parks St. Architect, F. Neil Brodie, Princess street. Two storeys, concrete foundation, frame construction. Plans ready.

Toronto, Ont.

Two detached residences, cost $11,000, Baby Point, for R. Home Smith, 18 King St. W. Architects, Chapman & McGiffin, 95 King E. Two storeys, 24 x 36, stone and brick construction and foundation. Plans drawn.

Two pair residences, cost $12,000, Indian Rd. Architect and owner, R. E. McDonagh, 184 Spadina Ave. 2½ stys., 38 x 42, brick construction. Plans ready.

One pair residences, cost $10,000, Bowden, for Erskine Smith, 408 Dovercourt Rd. Architect, D. E. Smith, 77 Victoria. 2½ storeys, 37 x 45, brick construction. Plans ready.

Three attached residences, cost $15,000, Seaton street, for Broadway & Reid, 111 Lansdowne. Architect, H. B. Wilson, 282 Woodbine ave. 2½ storeys, 48 x 50, brick construction and foundation. Plans drawn.

Vancouver, B.C.

Residence, cost $30,000, Shaughnessy Heights, for J. Y. Griffen, Rogers Bldg. Architect, Philip M. Jullien, Arts & Crafts Bldg. Two storeys, frame and stucco construction. Plans prepared.

Winnipeg, Man.

Residence, cost $12,000, Elm Park, for Jos. Snowden, 1003 Union Trust Bldg. Plans drawn by T. L. Kerr, 1006 McArthur Bldg. Three storeys and basement, 35 x 35 and garage 1½ sty., 15 x 22, concrete foundation, brick veneer construction. Tenders will be received by architect from May 17th to 24th.

CONTRACTS AWARDED

Auburn, Ont.

Manse, cost $4,500, for Auburn Presbyterian Church Congregation. General contractor, Luxton Hill, Blyth, Ont. Heating and plumbing, G. E. Denstedt.

Chicoutimi, Que.

Residence, cost $6,000, Racine, for Dr. Eugene Tremblay, Chicoutimi. Builder and general contractors, Lauzon Engineering Co., Quebec. Three storeys, 40 x 52, cement foundation, sheet iron roofing.

Edmonton, Alta.

Apartments, cost $15,000, Norwood Boulevard. Architect and general contractor, W. J. Baldry, 207 Beach avenue, Edmonton. Four storeys, 33 x 80, brick foundation and construction. Excavating done.

Residence, cost $5,000. Architect & owner, J. Horner, 575 Queens avenue, Edmonton. General contractor, Wm. McDonald, St. Albert, Alta. Two stys., 26 x 30, concrete foundation, brick veneer construction.

Residence and store, cost $16,000, for A. B. Agar, 537 16th street. Architect & general contractor, Mr. Aby, 4th street and Nelson ave. 2½ storeys, 34 x 40, cement foundation, frame construction. Excavating done.

Residence, cost $5,000, Prince & Namayo. General contractor and owner, H. Wall, 121 Lorne street. Two storeys, 24 x 30, brick, stone and cement foundation.

Forest, Ont.

Residence, cost $3,500. Builder and owner, Albert Hare, c/o R. E. Scott. 1½ storey, white brick construction.

Hamilton, Ont.

Residence, cost $15,000, Inglewood, for W. A. Noble, 80 George street. Architects, Watt & Blackwell, Lister Bldg. Owner supplies material and does work. Tapestry brick construction.

Residence, cost $5,500, Mountain ave. General contractor and owner, J. McNeil, 185 Hess street south. Pressed brick construction.

Apartments, cost $15,000, King East. Owner and general contractor, W. A. Noble, 80 George street. Three stys., 70 x 30. Foundations in.

Thirty-five residences, cost $52,500. Builders and owners, Naylor & Rob-shaw, 118 Scott street. Several residences are nearly completed.

Residence, cost $6,000, Melrose ave., for W. P. Thompson, 169 Emerald St. N. General contractor, Wm. Wark, 161 Emerald St. N. Pressed brick construction.

London, Ont.

Residence, cost $7,000, for C. E. Keene, 287 Hyman street. Architect, J. V. Munro, Bank of Toronto Bldg., London. General contractor, H. Hyman, 491 Ontario street. Two storeys, 28 x 38, brick.

Medicine Hat, Alta.

Residence, cost $5,000, Crescent Heights, for G. C. McBean, Imperial Bank Bldg. General contractor, A. McCarter. 1½ storeys, bungalow style.

Mitchell, Ont.

Residence, cost $4,000. Builder and owner, H. D. Davis, c/o The Advocate Office. Two storeys, white brick construction.

Montreal, Que.

Residences, cost $24,000, Belmont ave. Builder and owner, G. E. Blackwell, 4184 St. Catherine street. Owner will do most work, but is calling tenders for roofing and wiring. 2½ storeys, 25 x 50, rubble stone construction.

Residence, cost $15,000, Lansdowne ave., Westmount. General contractor & owner, Jno. H. Hand, 609 Belmont ave. Owner does all but roofing and electric wiring. He will call tenders for these two trades shortly. Two storeys and basement, 20 x 40, brick and stone construction.

Residence, cost $8,000, Outremont (Rockland), Architect and builder, J. S. Stone, 27 Cherrier. Two storeys and basement, 25 x 53, brick, concrete foundation, felt and gravel roofing. Owner undecided whether to call tenders or finish by day work. Foundations in.

Residence, cost $15,000, for Wm. Yuill, 37 Redpath. Architects, MacVicar & Heriot, 104 Union ave. Masonry and brick, W. M. Irving, 6 Guy Block. Structural steel, Phoenix Bridge Co., 83 Colborne street. Roofing, Silbey & Huot, 77 Duke street. Roofing and glazing, W. J. Ryan, 604 Victor ave. Plumbing and heating, W. A. Bradford, 42 Jurors street. Special fittings, Castle & Son, 568 St. Catherine street. Two storeys, 45 x 49.

Two flats and store, cost $5,000, Marie Anne. Builder and owner, O. Demers, 559 Fullum. Three storeys, 26 x 63.

Eight flats, cost $8,000, Delanaudiere. Builder and owner, M. Brosseau, 350 Garnier. Three storeys, 50 x 38.

Residence, cost $10,000, Outremont (Outremont and St. Cyrile streets). Builder and owner, Conrad Comtois, 739 Adam street, Maisonneuve. Three stys., 29 x 90, pressed brick construction.

Two cottages, cost $12,000, Outremont (Querbes). Builder and owner, Pierre Gurdazis, 418 Durocher ave. Two stys., 25 x 38, concrete foundation, brick construction.

Four flats, cost $10,000, [illegible]. Builder and owner, E. H. Crombie, 103 Grey ave. Two storeys, 48 x 45.

Nine flats, cost $9,000, 6th ave. Builder and owner, E. Dubois, 1414 Messier. Three storeys, 50 x 40.

Residence, cost $6,000, Outremont (De l'Epee). Builder and owner, David Abel, 2156 St. Urbain street. Two storeys, [illegible] x 30, concrete foundation, pressed brick construction.

Flats, cost $8,000, Verdun (Gordon). Builder and owner, V. Royal, 228 Galt street. Three storeys, 50 x 40, brick, concrete foundation.

Flats, cost $12,000, Verdun (2nd ave.). Builder and owner, Emery Daigneault, 1230 Evelyn. Three storeys, 40 x 75, brick.

Three flats, cost $5,000, Mentana. Builder and owner, P. Gagnon, 1265 St. Lawrence Blvd. Three storeys, 22 x 63.

Flats, cost $9,000, Verdun. Builder and owner, J. O. Fanteaux, 1365 Wellington. Three storeys, 50 x 45, brick, concrete foundation.

Residence, cost $8,000, Outremont (St. Catherine Rd.) . Builder and owner, Mr. C. Brien, 64 Quebec ave. Two storeys, 36 x 50, concrete foundation, rustic brick construction.

Residence, cost $8,000, for Mr. Ladernieve, Beaudry. Architect, J. A. Ouellet, 250 Amherst street. General contractor, J. Delorme, 2022 Christopher Columbus. Three storeys, 30 x 40, concrete footings, brick construction.

Residence, cost $24,000, Outremont (Rockland ave.). Builder and owner, D. Letourneau, 2600 St. Urbain street. Three storeys, 23 x 48, cement foundation, stone and brick construction.

Residence, cost $6,000, Maisonneuve (Charlemagne). Builder and owner, Jas. Labonte, 60 Charlemagne. Three stys., 45 x 78.

Residence, cost $9,000, Maisonneuve (4th ave.). Builder and owner, Allberic Lemay, 274 First ave. Three storeys, 52 x 100, pressed brick construction.

Residence, cost $6,000, Maisonneuve (Pie IX). for Zotique Dubois, Pie IX and St. Catherine. Builder, Ars. Choquette, 170 Bourbonniere. Three stys., 27 x 50.

Residence, cost $20,000, Outremont (Nelson ave.). Builder and owner, J. B. Fellowes, 337 Wiseman ave. Two stys., 24 x 45, rustic brick construction.

Four flats, cost $7,000, Champlain. Builder and owner, A. & P. Baudriau, 854 Craig E. Three storeys, 45 x 58.

Residence, cost $5,000, Maisonneuve. Builder and owner, F. Riopelle, 1102 Rachel. Three storeys, 25 x 63, stone and brick construction.

Residence, cost $6,000, Maisonneuve. (Bennett), for Ad. Ruellard, 127 Aird street. Architect, Chas. A. Reeves, 58 St. James street. General contractor, Mr. Prechette, 347 Frontenac. Three storeys, 25 x 40, cement foundation.

Ottawa, Ont.

Residence, cost [illegible], Clemow, for Mr. Allan, c/o Allan & Cochrane, Sparks street. Architect, W. Herbert George, Castle Bldg., Queen street. Masonry, Webb Bros., Pretoria. Carpentry, C. Nichols, 589 McLeod. Heating and plumbing, J. A. Langelier, 310 Wellington. Pressed brick construction.

Residence, cost $8,000, Clemow, for C. Smith, 289 Clemow. Architects, Keefer, [illegible] & [illegible], [illegible] Sparks street. General contractors, Smith Bros., 448 McLeod. Subcontracts not completed yet. 2½ storeys, stone foundation, brick construction.

Residence, cost [illegible], Laurier W. General contractor and owner, Wm.

Doran, 90 Somerset. Architect, J. Albert Ewart, 193 Sparks street. 36 x 45, brick veneer construction.

Apartments, cost $7,000, Church. General contractor and owner, Alf. Charbonneau, 222 Dalhousie. 27 x 60, brick veneer construction.

Residence, cost $12,000, Marlboro, for Lt.-Col. F. Gourdeau, 27 Goulbourne. Architect, C. P. Meredith, 126 Sparks street. Heating and plumbing, J. T. Blythe, Bank street.

Residence, cost $8,000, Mutchmore, for H. Putman, 146 4th ave. General contractor, J. R. Johnston, 3 Howick Place. 10 x 26, brick construction.

Port Arthur, Ont.

Ten residences, cost $50,000, for Col. S. W. Ray, c/o Ray, Street & Co. Architect, Fred Urry, 237 Arthur street. General contractor, Lester Cain, 20 Winnipeg ave. Two storeys, brick veneer construction.

Prince Albert, Sask.

Residence, cost $5,000, for T. G. McDonald. Architect, O. Allrechtson, Nanew Bldg. General contractor, A. Holmes, 19th street east. Three stys., cement foundation, brick construction.

Prince Albert, Sask.

Three residences, cost $4,000 each, for R. Clunie, E. 23rd street. Architect, National Builder (Magazine). General contractor, owner. Heating, Manville Co., Ltd., W. 22nd street. Electrical, H. W. Davy, 10th street east. Painting, H. R. Summers, W. 22nd street. Three stys., 25 x 25, cement foundation, frame construction.

Quebec, Que.

Residence, cost $15,000. General contractor and owner, Louis Careau, Maisonneuve ave. Architect, R. P. Lemay, 19 d'Aiguillon. Iron and steel, L. H. Gaudry Co., Ltd., 76 St. Pierre street. Cement foundation, Scotch brick and structural steel construction.

Toronto, Ont.

Two detached residences, cost $7,000, Jackman. Builder and owner, W. W. Hiltz, 682 Broadview ave. 2½ storeys, 22 x 38, brick construction.

Residence, cost $6,000, High Park Blvd., for N. S. Morden, Brunswick ave. Builder, Wm. Vokes, 228 Rusholme Rd. 2½ storeys, 28 x 39, structural steel and brick construction.

Windsor, Ont.

Residence, cost $7,000, Fairmont, for W. G. Nelson, c/o Hopper Bros., general contractors, 15 Linden Terrace. 3-storeys, 32 x 34, brick veneer construction.

Power Plants, Electricity and Telephones

Edmonton, Alta.

Power station, cost [illegible], planned. Clerk, C. E. Cox. Architect, A. J. Jeffers, City Architect. Engineer, A. J. Latornell. One storey, 40 x 54, electric lighting, concrete foundation, brick construction.

Mount Forest, Sask.

Mount Forest Telephone Co. contemplate a new telephone system. President, Leopold Stewart. Secretary, J. A. Monrees, Melfort. All material for construction will be required.

(Continued on page [illegible])

Tenders and For Sale Department

Sealed Tenders Wanted

Sealed tenders will be received by David [illegible] Public Schools of the [illegible] County, Ontario, until six o'clock p.m. on the **30th day of May, 1913**, [illegible] of an eight-room [illegible] School Building, except plumbing, heating and ventilating.

Tenders for plumbing, also for heating and ventilating of the same building will be received at the same place, time and date.

All proposals shall be in accordance with plans and specifications, copies of which are on file at the offices of the Architects Edward C. Van Leyen and Edward A. Schilling, 1115-21 Union Trust Building, Detroit, Michigan, and No. 7 Manning Block, Windsor, Ont.

Copies of the plans and specifications can be had by applying to the aforesaid architects and making a deposit of $20 for the care and safe return of drawings.

Tenders shall be accompanied by a certified cheque in the sum of five per cent. of the amount of proposal, payable to the Public Schools of the Town of Sandwich, as a guarantee to furnish satisfactory bond and entering into contract.

The Board reserves all rights under the specifications to accept or reject any or all bids.

DAVID TASKER, Secretary.

The Public Schools of the Town of Sandwich.
20-21

Sealed tenders addressed to the undersigned, and endorsed "Tender for Dry Dock at Lauzon, Que.," will be received at this office until 4 p.m. on **Monday, June 23, 1913**, for the construction of a Dry Dock at Lauzon, in the County of Levis, Que.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. E. W. Dodwell, Esq., District Engineer, Halifax, N.S.; J. K. Scammell, Esq., District Engineer, St. John, N.B.; Chas. Chapais, Esq., District Engineer, Post Office, Quebec; J. L. Michaud, Esq., District Engineer, Post Office, Montreal; District Engineer's Office, Confederation Life Building, Toronto; H. J. Lamb, Esq., District Engineer, Windsor, Ont.; W. Z. Earle, Esq., District Engineer, Ashdown Building, Winnipeg, and on application to the Postmaster at Lauzon, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order.

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40715. 20-21

CITY OF FORT WILLIAM

Waterworks Tunnels

Sealed tenders, addressed to the City Clerk and endorsed "Tenders for Tunnels," will be received up to 12 o'clock noon on **Thursday, May 29th, 1913**, for the construction of three tunnels in Hudson Shale, etc., with reinforced concrete lined shafts, viz.:

Tunnel under Kaministikwia River, **1,275 ft.** long, **7** ft. wide, **8** ft. high, **119** ft. deep.

Tunnel under Mission River, **677** ft. long, **5** ft. wide, **6** ft. high, **95** ft. deep.

Tunnel under McKellar River, **629** ft. long, **5** ft. wide, **6** ft. high, **91** ft. deep.

Plans and specifications may be seen and forms of tender may be obtained at the office of T. Aird Murray, Esq., 303 Lumsden Bldg., Toronto, Ont.

Tenders must be sent in on form supplied. The lowest or any tender not necessarily accepted.

A. McNAUGHTON, City Clerk,
Fort William, Ont.

RAY R. KNIGHT, City Engineer,
Fort William, Ont.

T. AIRD MURRAY, Con. Eng.,
Toronto, Ont.

Fort William, April 26, 1913. 18-21

Sealed tenders addressed to the undersigned, and endorsed "Tender for Passenger Elevator and enclosure in the West Block, Ottawa," will be received at this office until 4 p.m. on **Wednesday, May 28, 1913**, for the construction of the works mentioned.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompaniel by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 7, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40173. 20-21

CITY OF PORT ARTHUR

PROVINCE OF ONTARIO

Tenders for Pumps, Etc.

Tenders will be received by undersigned up to **June 2nd**, for three motor driven centrifugal pumps of two thousand gallon per minute capacity, together with pumping valves, meters, switchboard, and all necessary apparatus for operating same.

Specification and tender form can be seen at office of L. M. Jones, City Engineer, Port Arthur, Ont., or T. Aird Murray, Consulting Engineer, Lumsden Building, Toronto, or at the Winnipeg offices of Contract Record & Engineering Review and Canadian Engineer. Ten per cent. deposit. Lowest tender not necessarily accepted.

J. J. HACKNEY.

Port Arthur, April 28, 1913. 21

Separate sealed tenders addressed to the undersigned, will be received until 4 p.m., **Monday, June 23, 1913**, for the following works on the New Barracks property, Long Branch, near Toronto, Ont., viz:—

(1) Water Works pipe laying. (2) Sewer pipe laying. (3) Pump House, Filter House and Reservoir. (4) Foundations for Water Tower. (5) Steel water tower and supports. (6) Water Works Intake Pipe and Well. (7) Sewage Pumping Station. (8) Sewage Disposal Works, (9) Bridges or Viaducts.

Each tender must be sent in a separate envelope and endorsed, "Tender for Waterworks pipe laying, New Barracks, Toronto, Ont." "Tender for Sewer pipe laying, New Barracks, Toronto, Ont.," etc., as the case may be.

Each person or firm may tender for any number or all of the above works, but a separate tender must be submitted for each work. (No bulk or conditional tender will be entertained).

Plans, specifications and forms of contract can be seen and forms of tender obtained at the office of Messrs. Chipman and Power, Engineers, Mail Building, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40717. 20-21

Town of Oshawa, Ontario

Sidewalk Construction

Sealed tenders will be received up to noon of **Saturday, May 31st, 1913**, for the construction of 25,000 square feet, more or less, Cement Concrete Sidewalks in the Town of Oshawa.

Specifications may be obtained from the Town Engineer's Office, Town Hall, Oshawa.

The lowest or any tender not necessarily accepted.

FRANK CHAPPELL,
20-21 Town Engineer.

TOWN OF BOWMANVILLE

PROVINCE OF ONTARIO

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on

Friday, May 30th, 1913

for the construction of

Sewage Disposal Works

Plans and specifications may be seen at the Town Hall, Bowmanville, and at the office of the Engineers, Toronto.

Deposit cheque of $500 required.

No tender necessarily accepted.

S. C. HILLIER, Esq., Mayor.
JOHN LYLE, Esq., Town Clerk.
CHIPMAN & POWER, Engineers.
20-21

Sealed tenders addressed to the undersigned, and endorsed "Tender for Men's Block, New Barracks, Toronto, Ont.," will be received until 4 p.m. on **Tuesday, June 24, 1913**, for the construction of a Men's Block, New Barracks, Long Branch, near Toronto, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the office of Mr. Thos. Hastings, Esq., Clerk of Works, Postal Station "F," Yonge Street, Toronto, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 39115 20-21

CONTRACTORS

Why don't you try this new firm for quick delivery of supplies. The International Supply & Construction Co., Ltd., Hull, Que. 21-24

CITY OF HAMILTON, ONT.

West End Sewage Disposal Work

Notice is hereby given, that the time for receiving tenders on above work is extended to 10 a.m., **Tuesday, May 20th, 1913.**

Plans, specifications and form of tender may be obtained from the office of the City Engineer, Hamilton, Ont.

S. H. KENT, City Clerk.

Hamilton, Ont.,
May 7th, 1913. 20-21

City of Belleville

Public School Tender

Sealed tenders will be received by the undersigned up to 6 o'clock p.m. on **Monday, June 9th**, for the erection of an eleven-room school building. Tenders must be accompanied by a certified cheque for ten per cent. of tender. Envelope to be marked "Tender for School Building." Plans and specifications and all information may be obtained on application at the office of Messrs. Ellis & Connery, architects, Toronto, and at the office of the undersigned. The lowest or any tender not necessarily accepted.

B. MALLORY,
21 Chairman Sites, Building & Repairs.

Tenders for Dredging

Sealed tenders addressed to the undersigned and endorsed "Tender for Dredging, Ontario," will be received until 4 p.m., **Wednesday, June 4, 1913**, for dredging required at the following places in the Province of Ontario:—

Cloud Bay, Whitby, Bruce Mines, Hilton, Killarney, Little Detroit, Walker River.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

A separate cheque for each place for which a tender is submitted must accompany the tender. This cheque must be equal to five per cent. (5 per cent.) of the amount of the tender, based on the approximate quantities set opposite the name of place, [illegible] a less sum than $1 500. The cheque must be accepted, on a chartered bank, and payable to the order of the Honourable the Minister of Public Works. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 15, 1913

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 40791 21-22

Tenders Street Machinery

Town of Welland

Tenders will be received by the undersigned until **Tuesday, May 20th, at noon**, for the following material.

One 600 Imperial Gallon Street Sprinkler.

One Rock Crusher, having capacity of 10 to 15 tons per hour, Elevator, Rotary screen and 15-ton Portable Bin.

Competing firms to send descriptive matter, state number of days required after acceptance to make delivery.

Price to include all freight and duty charges to Welland.

The lowest or any tender not necessarily accepted.

D. T. BLACK, Town Engineer.

May 7th, 1913 [illegible]

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Collingwood," will be received until 4 p.m., **Thursday, June 5, 1913, for** dredging required at Collingwood, Ontario.

Tenders will not be considered unless made on the forms supplied and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa, and plan of work may be seen at the office of the Assistant Chief Engineer of Public Works, Ottawa, and the office of the District Engineer, Confederation Life Building, Toronto, Ont. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, [illegible]

[illegible]

Sealed Tenders

[illegible] Monday, [illegible] June 10th, 1913 [illegible]

L. F. KATZENMIER,
[illegible] Clerk.

Board of Education

City of Toronto

[illegible] addressed to the Secretary, [illegible] will be received until

Thursday Noon, May 29th, 1913

for

Oakwood High School

One Band Saw; One Jointer; One Borer; [illegible] One Emery Grinder; One Disc Sander; One 5 Horse Power Motor; One Lathe; One Grindstone; One Disc Grinder; One Mortising Machine; One Universal Trimmer; One Self Feed Trimmer; One Self Feed Post Drill.

Specifications may be seen and all information obtained at the office of the Clerk of Supplies, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall, not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

ALEX. MacKAY, M.D.,
Chairman of Committee.
W. C. WILKINSON,
Secretary-Treasurer.

Board of Education

City of Toronto

Sealed tenders, addressed to the Secretary-Treasurer of the Board, will be received until

Tuesday Noon, May 27th, 1913,

for

Cabinet Work, Technical School

and

Sale of Old Buildings

on Borden and Lippincott Streets

Specifications for which may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall.

Also the following:

One Tool Post Grinder; Three Machinist Vises; Three Engine Lathes; Three Wood Working Lathes; One Bench Jointer; One Bench Band Saw; One Trimmer; One Variety Saw Table with equipment for the Central Technical [illegible]

Specifications for which may be seen and all information obtained at the office of the Clerk [illegible]

Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall, not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

J. A. ELLIS,
Chairman of Committee.

W. C. WILKINSON,
Secretary-Treasurer.

21

Tenders for Reservoir

Sealed tenders will be received by the undersigned up to **June 10th** for the erection of a Reservoir for the Leamington Waterworks System; same to be 45 feet x 80 feet x 15½ feet deep (inside), of reinforced concrete, and roofed.

Plans and specifications at the office of the Town Clerk. The lowest or any tender not necessarily accepted.

R. M. SELKIRK, Town Clerk.

Leamington, May 16, 1913. 21

CITY OF SASKATOON

Sedimentation Basin

Invitation to Tender

Sealed tenders, addressed to the City Commissioners, Saskatoon, and endorsed on the envelope "Tender for Sedimentation Basin," will be received for the construction of the said Basin until twelve o'clock noon on **Friday, the sixth day of June, 1913.**

Plans, specifications, instructions to bidders, general conditions and form of agreement may be seen at the office of George T. Clark, City Engineer, Saskatoon, or will be forwarded on receipt of a marked cheque for $15, which will be refunded if plans are returned with the tender.

Bidders must forward a marked cheque or a deposit in cash for five per cent. of the total contract price with their tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved Surety Company.

The lowest or any tender not necessarily accepted.

F. E. HARRISON, Mayor,
Chairman of Commissioners.

Saskatoon, May 8th, 1913. 21-22

Board of Education

City of Toronto

Sealed tenders, whole or separate, addressed to the SecretaryTreasurer of the Board, will be received until

Friday Noon, May 30th, 1913,

for the several trades required for the enlargement of

Balmy Beach School, Pine Ave.
Lansdowne School, Spadina Cres.

for

Heating, Plumbing, Electric Wiring at Frankland School

and for

Midsummer Repairs, including Cabinet Work

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall, not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

W. C. McTAGGART,
Chairman of Committee.

W. C. WILKINSON,
Secretary-Treasurer

21

Tenders for Highway Bridges

Sealed tenders, marked "Tender for Grand River Bridges," will be received by the undersigned up to 9 p.m. on **Saturday, June 7th, 1913,** for the construction and erection of the following steel highway bridges in the Township of East Garafraxa:—

1.—A 120-foot single span through bridge.
2.—Two 70-foot spans, low truss, box chords.

A form of tender and all information may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHEELOCK,
County Engineer,
Orangeville, Ont.

Orangeville, May 17, 1913. 21-22

Tenders for Cement Walks

City of Sault Ste. Marie, Ontario

Sealed tenders fully endorsed and marked "Tender for Cement Walks," addressed to T. E. Simpson, Mayor, Sault Ste. Marie, Ont., will be received by the City Clerk up to seven o'clock p.m. on **Monday, June 2nd, 1913,** for the construction of about 116,000 square feet of cement concrete sidewalks.

Specifications and plans may be seen and all information and forms of tender obtained at the office of the City Engineer, Sault Ste. Marie, Ont.

A marked cheque for $1,400, payable to the order of the City Treasurer, must accompany each tender. A bond to the amount of $5,000, or in lieu thereof a cash deposit of $3,000, will be required of the successful bidder.

The lowest or any tender not necessarily accepted.

C. J. PIM, City Clerk.

W. W. VAN EVERY,
City Engineer.

21-22

Notice to Contractors

SEWERS

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, May 27th, 1913,** for the construction of the following sewers:

King street, from Bathurst street to Portland street.
Logie Place, from Crawford St. to Shaw St.
Lane first north of King street, from John street to Peter street.
Lane first west of Henry street, from Cecil street to College street.
Lane first south of College street, from Euclid to Manning.
Lane first south of Bloor street, from Ossington ave. to Roxton Road.
East Toronto Midway outlet, sections 1 and 2.
West Toronto outlet, div. 2, Keele street.

Envelopes containing tenders must be plainly marked on the outside as to contents. Specifications may be seen and forms of tenders obtained at the office of the Commissioner of Works, Toronto.

Tenderers shall submit with their tender the names of two sureties, or in lieu of said sureties, the bond of a guarantee company approved of by the City Treasurer. The usual conditions relating to tendering as prescribed by the city by-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman Board of Control.

Toronto, May 15th, 1913. 21

Tenders for Bridge Work

Tenders will be received by the undersigned up till the evening of **Friday, May 30th, 1913**, for the following bridge work for the County of Halton.

(1) For an 18-foot concrete arch bridge on the County road 1½ miles north of the Village of Acton, known as Clarridge's Bridge.

(2) For excavating for and rebuilding the abutments for Cooper's Bridge in the Village of Glenwilliams, and for the concrete bridge floor.

(3) For a 100 foot steel span erected complete excepting the concrete floor for Cooper's Bridge.

Plans and specifications may be obtained on application to the undersigned or may be seen at the offices of the following parties, viz., The Reeve of Georgetown, the Reeve of Acton or J. Hutcheon, Engineer, Guelph.

The lowest or any tender not necessarily accepted.

J. G. WILSON,
County Road Superintendent.
Burlington, Ont.
May 19th, 1913. 21

Bridge Tenders

Tenders will be received by the undersigned up to noon on **May 29th, 1913**, for —

(a) 75 ft. Steel Bridge.

(b) Concrete Abutments.

To be built near the Village of Ayr for the Counties of Waterloo and Oxford. For further information apply to

BOWMAN & CONNOR,
Civil Engineers,
21 Berlin, Ont.

TOWN OF BRAMPTON

TENDERS

Sealed tenders addressed to the undersigned will be received up to 6 p.m., **Monday, June 2, 1913**, for the construction of the following:

A.—8,000 square yards concrete roadway with concrete curb.

B.—Concrete Arch Bridge.

C.—Concrete retaining wall.

Plans and specifications may be seen at office of Town Engineer, Municipal Buildings, Brampton, Ont. Marked cheque for 5 per cent. of amount must accompany each tender. Separate tenders required for the different works. No tender necessarily accepted.

W. M. TREADGOLD,
Town Engineer.
Brampton, May 20, 1913. 21-22

Tenders for the Construction of Sewers

Sealed tenders will be received by Mr. C. M. Webber, Town Clerk, Welland, Ontario, up to noon on **Monday, June 2, 1913**, for the construction of Separate Sewers on the following streets:

North and West Main streets, [illegible] street, Ross street.

[illegible] at Engineer's office, Welland. [illegible] may also be seen at office of Contract Record & Engineering Review, [illegible] West, Toronto.

A marked cheque for 10 per cent. of the amount of the tender must accompany each tender [illegible] will be accepted.

The lowest or any tender not necessarily accepted.

[illegible]
Welland, May [illegible], 1913. 21-22

TENDERS

Tenders will be received by the undersigned until 5 p.m., **May 30th**, for the following works:

Approximately 12,300 sq. yds. Concrete Pavement, with 9,900 feet of Concrete Curb.

Approximately 3,300 square yards Brick Pavement, with 3,000 feet of Curb and Gutter.

Plans and specifications and all information may be had at the office of the City Engineer.

M. FERGUSON,
City Engineer.
St. Thomas, May 19, 1913. 21-22

FOR SALE

FOR SALE—One Beatty one yard Clam Shell Bucket in very good repair. Reason for selling install larger bucket. Apply Cadwell Sand & Gravel Company, Ltd., Windsor, Ont. 20-21

FOR SALE

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

For Sale

1—12-in. x 30-in., 90 h.p. Jenckes Corliss Engine.
2—54-in. x 14-ft., 60 h.p. Jenckes Boilers.
1- Small Duplex Boiler Feed Pump.
1—125 h.p. Laurie Feed-water Heater and Purifier
1 150 h.p. Wainwright Evenflow Feed-water Heater.
1 20-in. [illegible]
1—20-in. swing 8-ft. bed John Bertram Engine Lathe with taper attachment.
1 20-in. swing 12-ft. bed John Bertram Engine Lathe.
1 London Machine Tool Co. 30-in. x 30-in. x 8-ft. Planer.
1 London Machine Tool Co. 30-in. x 24-in. x 8-ft. Planer.
1 New 2 Horse Power Tread Mill.

Canadian Ingersoll-Rand Company, Ltd.,
Commercial Union Building,
21 Montreal, Que.

For Sale

Tenders wanted for purchase in whole or in part of the following apparatus:

1 [illegible] 125 h.p. [illegible]
1 Laurie Corliss Engine, 90 h.p., 13 x 30.
2 [illegible]
36 ft. 4 in. line shafting, complete with vertical shaft hangers and boxes and 2 friction clutches.
2 belt tighteners.
1 pulley, [illegible]
1 pulley, 30 x 22.
1 pulley, [illegible]
1 pulley, 17½ x 72
1 pulley, [illegible]
70 ft. 2 ply, 17½ in. leather belt
61 ft. 2 ply 16 in. leather belt.
82 ft. 19½ in. leather belt.
Approximately 100 ft. 4 in. steam pipe with [illegible]

All the above apparatus in first class shape [illegible] tion of Hydro Electric Power and may be seen [illegible]

H. M. MILLER,
Sec. W. L. & H. Commission,
19-22 [illegible]

How About These?

No. 2 Smith Mixer with engine and boiler on trucks, A1	$ 425
Lidgerwood Class B all steel Drag Line with 1½ yd. and 1 yd. buckets, 60 ft. boom, A1.	3,200
30 1½ yd. end dump Cars, 36-in. gauge, practically new ... ... ea.	30
1 American Well Works Air Compressor, 12 x 12 x 14, 340 ft. capacity. New	440
10 x 14 Rand Belted Compressor.	275

Bargains, aren't they?

We have many others in hoisting engines, locomotives, steam shovels, crushers, etc. We are cutting prices. Wire!

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WANTED Manager, either practical builder or engineer, familiar with Concrete Construction houses and factories. Excellent position for the right party. Apply, giving references and experience, to Box 798, Contract Record, Toronto, Ont. 21-22

Wanted Manager for a Western Construction Company who will take a financial interest in business. Must have thorough knowledge of building. The company has a small mill in connection with their present business. Present manager retiring. This is a good opening for the right man. Address all correspondence to Box 793, Contract Record, Toronto. 20-22

Power Plants, Electricity and Telephones

(Continued from page 71)

Naisberry, Sask.

The Naisberry [illegible] install system. President, T. Cochrane. Secretary, T. A. Monrees, Melfort. All material for construction of above will be required.

St. Joseph de Sorel, Que.

The Sorel Light & Power Co., Sorel, Que., contemplates moving its power house from Elizabeth street, Sorel, probably next fall. New building will be erected.

Vienna, Ont.

[illegible] Gas Company will shortly undertake extensive development work in Vienna district and laying of new lines.

Business Notes

Centre Blissville, N.B.

Sawmill owned by Luther B. Smith burned. Loss to building, $13,000; insurance, $12,000.

London, Ont.

Livery stable of Mrs. Ann Highby, Ridout street, destroyed by fire. Loss $3,000, partly covered by insurance.

Moncton, N.B.

Moncton Baptist Church destroyed by fire. Pastor, Rev. Mr Lawson, Moncton, N.B. Will be rebuilt at once.

Niagara Falls, Ont.

[illegible]

Telephone Junction 2342

STONE

A. B. SILCOX,
Standard Bank Building,
TORONTO

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A few dollars spent in advertising your proposals in the

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and Engineering Review

would result in additional competition, which might save your city or town or your client many hundreds of dollars.

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We can tell you—who are buying, what they are buying, when they are buying regarding any Building Material whatsoever, and thus aid you materially in the sale of your products. MacLean Reports are today the basis and starting point of the Sales Departments of most of the big firms that secure the big contracts, because with MacLean Reports they are first in the field, fortified with specific information, and lose no time through "lost motion." *Let us show you our method.*

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RED BRICK
MAKERS OF NORTH AMERICA

For over twenty years we have been making this remarkable unfading natural
RED BRICK
Distinctive in its rich, clear, fresh color

"Bradford Reds"

Manufactured in Roman and Standard sizes, are unequalled for uniformity and shade
A pressed brick and each one is inspected before being shipped.

Thousands of buildings and residences are our testimonials

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Manufactured with rough textured face offer an unsurpassed rustic effect, specially desirable for residences walls, fences and such ornamental construction.

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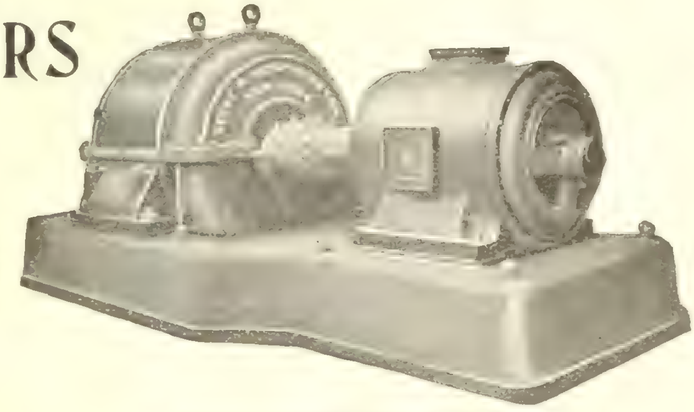
and

TURBO-COMPRESSORS

In large capacities at high speeds

Recognizing the advantages of Turbo-Blowers and Turbo Compressors over reciprocating air compressors, in many fields, the Worthington Company have secured the exclusive rights to build the products of Messrs. Pokorng and Wittekind of Frankfort, Germany.

These Turbo-Blowers and Turbo-Compressors are now built in capacities of 5,000 cu. ft. and over, at speeds of 3,000 to 4,500 r.p.m., and require direct drive, either by steam turbine or 60 cycle electric motor. For full particulars see Bulletin 201.



MOTOR DRIVEN TURBO BLOWER

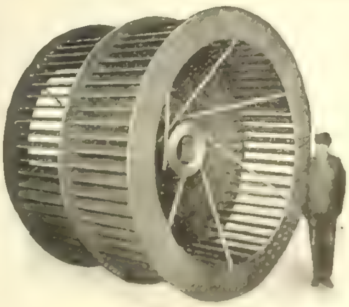
Type for 10,000 to 30,000 cu. ft. per min. 15 lbs. gauge pressure

Exclusive Agents for Canada

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL. Sales Offices: MONTREAL, TORONTO, COBALT, WINNIPEG, CALGARY, VANCOUVER.

Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.



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TRADE MARK.

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Low cost of Installation, low cost of Operation, low cost of Maintenance, and High Efficiency are the deciding features of "Sirocco."

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Aside from our own Expert Engineers we have at our command the co-operation of the Engineering Service Department of the American Blower Company, and the results of years' of experience of S. C. Davidson, the inventor, Belfast, Ireland.

A "Sirocco" Fan will deliver more air with less power than the ordinary steel plate fan **twice** the size.

"Sirocco" Fans and Blowers are used in connection with apparatus for Heating, Ventilating and Cooling, in Industrial, Educational, Office and Public Buildings.

For Forced and Induced Draft under steam boilers on land and at sea.

The world's largest boats use "Sirocco" Fans for Forced Draft and Hull Ventilation.

The British Navy use "Sirocco" exclusively.

Let us tender on your next air handling problem. The services of our Engineering Department are at your command.

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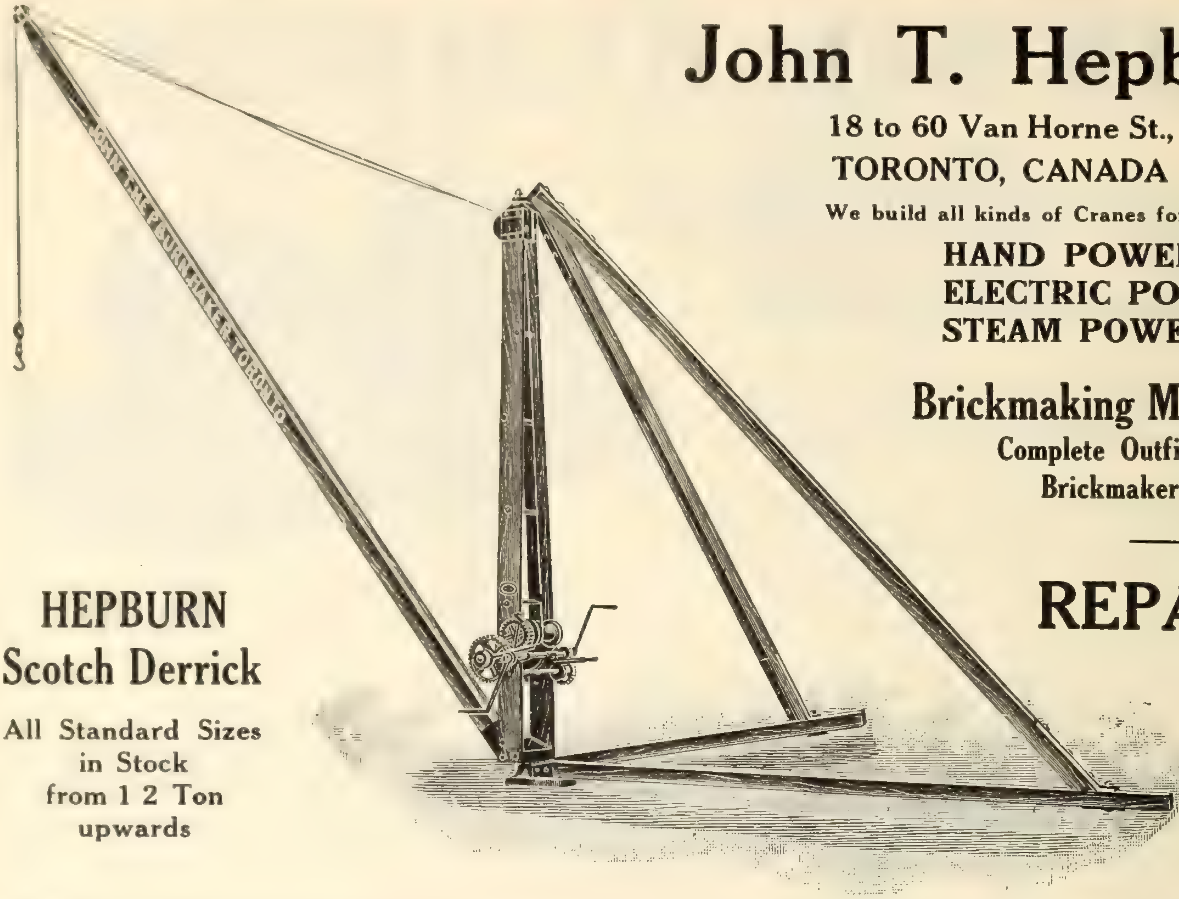
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TUEC STATIONARY AIR CLEANING SYSTEM

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Are known from coast to coast for their strong construction and durability, and are in use on the largest construction works in the country.

Only the very best materials enter into their manufacture and our trade mark stamped on every shovel is a positive guarantee that goods are as represented.

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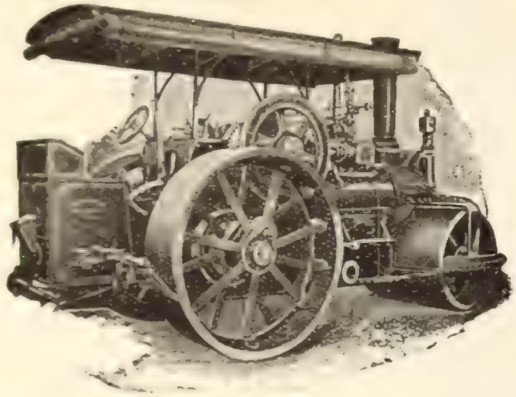
Saving Costs In Road Building—

Road building is mainly a matter of labor. With $5.00 a day being paid for teams and $2.00 a day for men, the one way to cut down road making costs is to employ machinery to do the work wherever possible. The more continuously this machinery can be kept at work the greater the economy effected.



The

Waterous Roller

is the one all-round road builder. It can be used to haul road plow, scarifier, or grader. It will pick up the old road-bed or pavement. Without change or extra expense it will easily replace six teams to haul wagon train long distances at a great saving over team or traction engine work. It will drive rock crusher or stone screen when other work is at a standstill. On one or other of these operations with the work properly laid out it can be kept busy all the year round.

Further, the Waterous Roller is driven by steam, the oldest, simplest and most reliable of motive powers. It carries a double cylinder, double crank engine, large capacity locomotive boiler, steel cut gears, locomotive link valve motion, all special features that mean ease and simplicity of control and economy in operation. Every part is designed and built to stay right and it does. Waterous Rollers sold nineteen years ago are still doing first class work.

Because it can be used in every operation in road building, because it can be employed every working day in the year, and because it is constructed to be "on the job" whenever wanted, the Waterous Roller is the most economical road maker that can be bought.

Over 150 satisfied users—among them the largest municipalities and leading contractors in Canada—are the best proofs we can offer to back our claims.

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The Waterous Engine Works Co.
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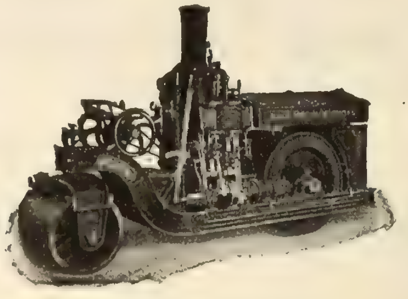
ERIE MACHINE SHOPS



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Send for our Catalogue of Asphalt Rollers and Mixers.

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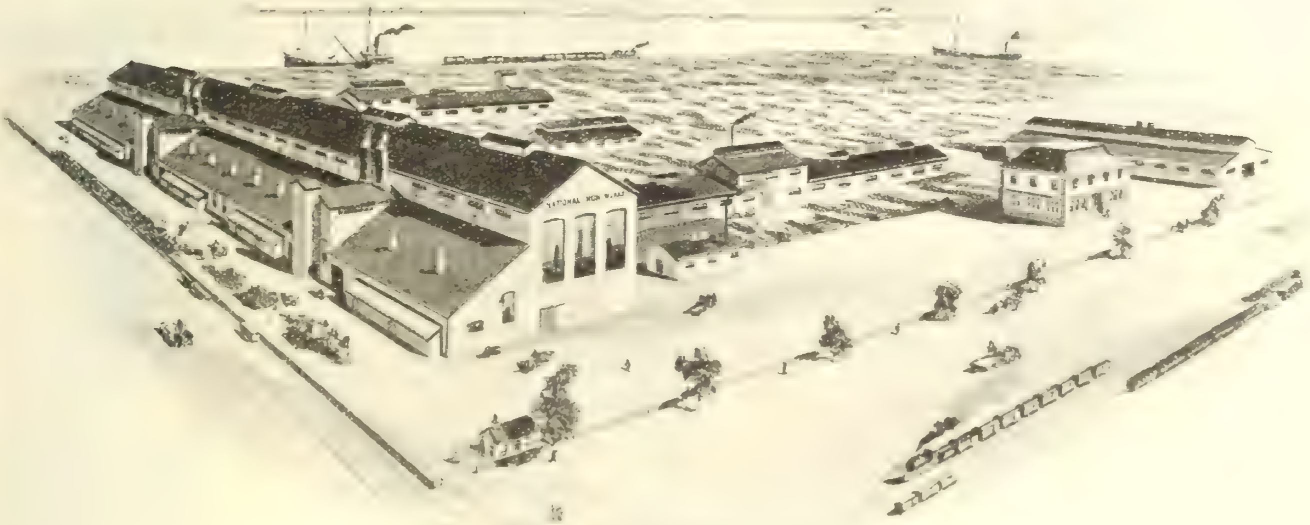

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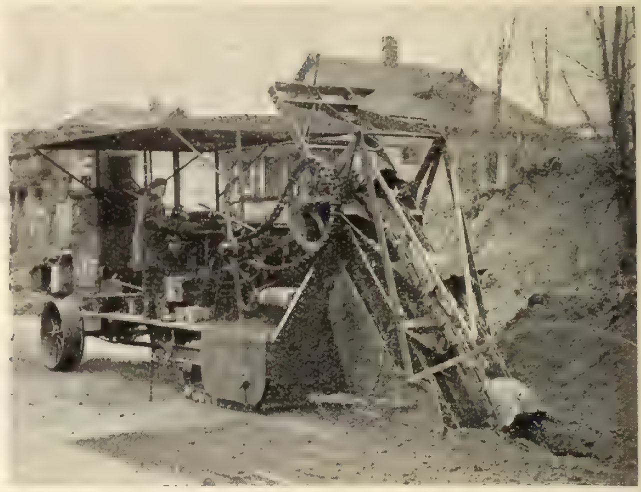

Trench Excavator
Traction Wheels

The purpose of the "traction wheels" on a trench excavator is to "feed" the excavating buckets into the the bank being excavated as well as to transport the machine along the work and from trench to trench.

Trench excavator traction wheels are therefore essential parts of its work-producing mechanism, for the manner in which such an excavator is "fed" into its work is just as important to efficiency as is the manner in which the cutting tool of a wood or metal turning lathe is "fed" into its work.

Austin Trench Excavator traction wheels are "multipedal tractions" which not only "crowd" the cutting buckets into the bank but hold the whole machine from slipping back or slewing sideways.

Austin Multipedal Tractions
Non-Miring Non-Slipping Non-Slewing

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Railway Exchange,
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Represented in Eastern Canada by
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THE CANADIAN EQUIPMENT & SUPPLY CO., Calgary
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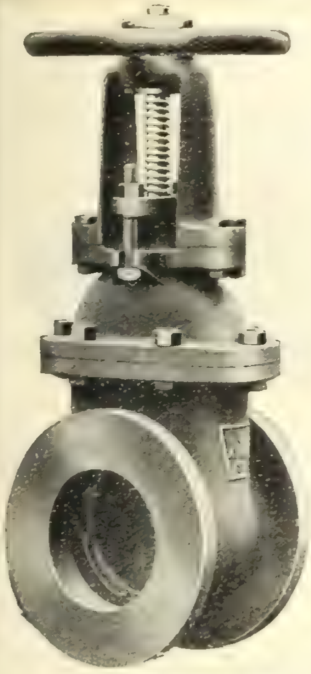

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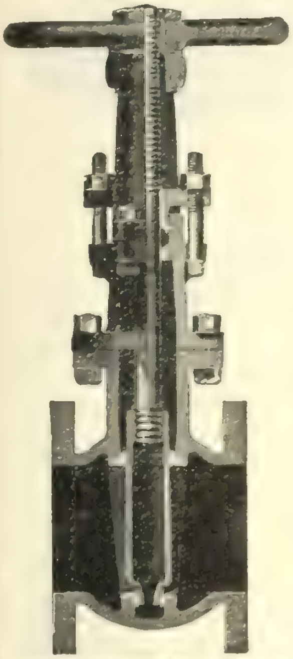
Iron Body GATE VALVES

are not surpassed by any other gate valve in **Design, Quality** of material, **Durability, Workmanship,** and up-to-the-minute requirements.



They have been designed and are built to meet the specifications of the most exacting and critical Engineers, and will bear the rigid scrutiny of "THE MAN WHO KNOWS."

If you are particular about the valves you specify or buy, you will not only **specify, but demand Kerr (Keystone) Iron Body Gate Valves.**

Any **Kerr Valve** lends class and distinction to any steam or water job.

Manufactured and Guaranteed by

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Limited
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VALVES
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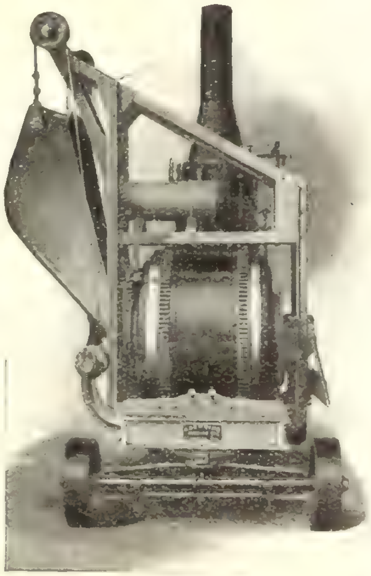
exclusive output.

The Mixer That Lasts

The Koehring "3 in 1"



We know that concrete mixers get hard service—and so we build THE KOEHRING to *stand* hard service.

We do it by putting the right kind of material into every part of THE KOEHRING—and *enough* material.

It ruck, for instance, is very rugged; it is made with a full 100% safety factor of strength.

Then here are features of design that add greatly to its lasting qualities.

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Our very complete side loader can be raised to an almost vertical position, so discharging into the drum *without pounding the bucket.*

Don't buy until you have investigated all these detailed superiorities of THE KOEHRING. The few points outlined here are but indications of the many you should know about.

The Koehring "3 in 1" Mixer Book No. 18 Gives Full Details

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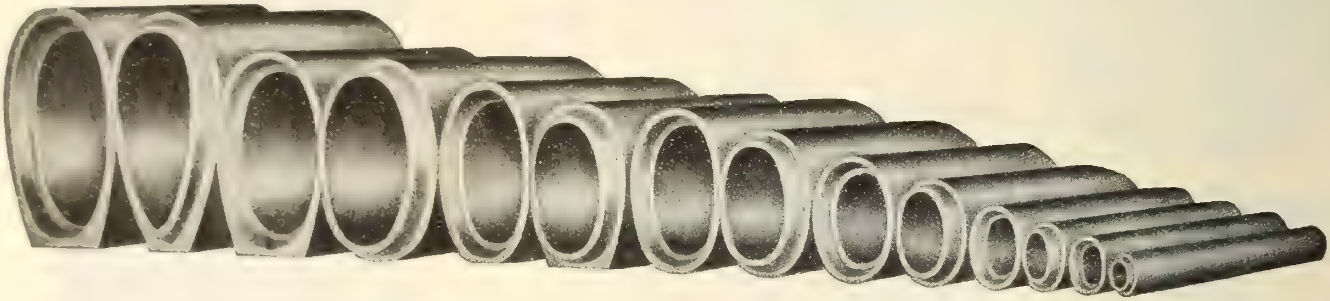

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OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

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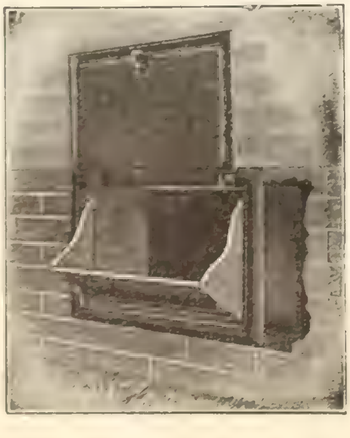

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with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

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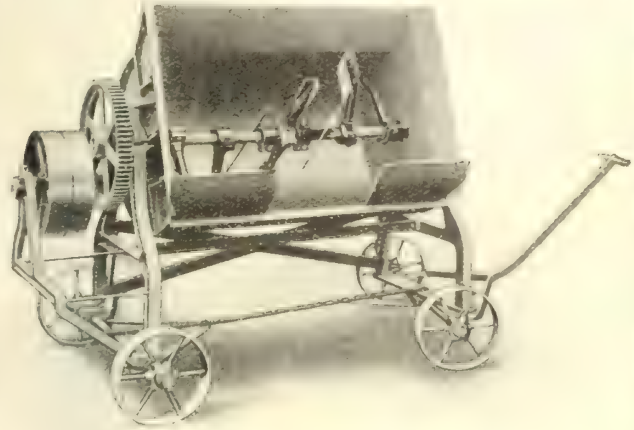
The Mixer With a Record



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For combination shop and outside use this Hand Truck Mixer is acknowledged to be the very best on the market. It has been used on hundreds of sidewalks and foundation contracts with unqualified success. It is strongly built and so simple in design that it will never give any trouble with repairs.

Strongly Made—Well Balanced **Easy to fill—Easy to Dump**

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Corrugated Iron

BLACK, PAINTED OR GALVANIZED
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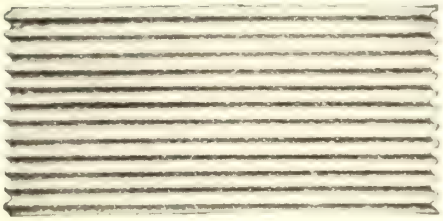
Stock carried of all gauges, lengths up to 10 feet.



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and all other necessary sundries.

We Specialize on
Curved Sheets for Concrete Supports

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SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

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Manufactured by
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1—10 x 16 Standard Gauge Porter Locomotive
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1—7 x 10 Lambert D.D. Hoist
1—10 x 12 Beatty D.C. D.D. Hoist with Swinger
1—5—Ton Tandem Roller
1—20 H.P. Waterous Portable Boiler
1—30 H.P. Locomotive Boiler on Skids
5—Rock Drills
1—No. 2 Smith Concrete Mixer
1—No. 2 Milwaukee Concrete Mixer
1—15 H.P. Upright Boiler

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
340 Sparks Street, Ottawa, Ont.

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Our
Prices
They
are
Right

PROMPT SHIPMENT IN

BOILERS

Water Tubes

Horizontal Return Tubular
Fitzgibbons, Scotch Marines,
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Steel Water Towers, Tanks and Heavy Plate Work.
Cast Iron Columns and Bases. Post Hangers

Buy
Berg

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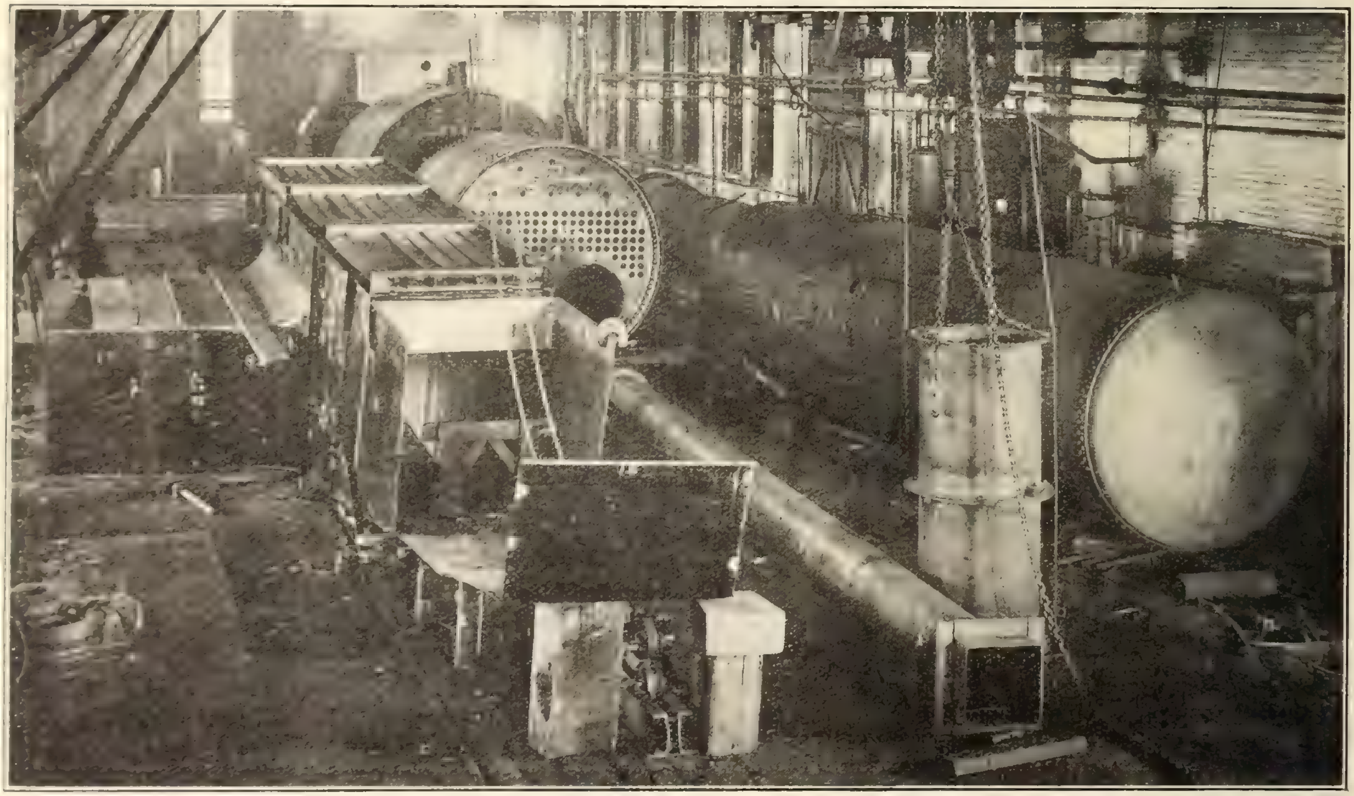
Best



A small section of our Boiler Shop
showing a few Marine Boilers
under construction.

The Berg Machinery Mfg. Co., Limited

Boiler Department

Bathurst and Niagara Sts. **TORONTO, ONTARIO**

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Wires and Cables

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Copper and Aluminum

Copper Clad (Duplex Metal) Wire

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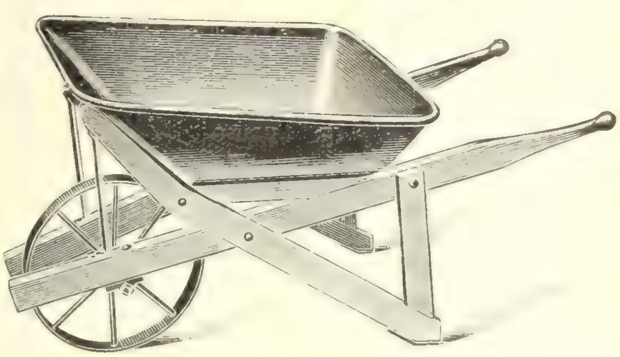
IRON AGE



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As makers of the high grade "Iron Age" products we solicit your trade in the following lines:—

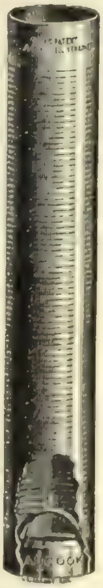
DRAG AND WHEEL SCRAPERS—
Each Drag Scraper is pressed from a solid sheet of high-carbon steel—no joints or seams. Our Wheel Scrapers have all the latest dumping attachments and are supplied with either pressed or square bowl. All "Iron Age" Scrapers are of standard capacity.

STEEL TRAY BARROWS—
The trays are pressed from a solid sheet of high-carbon steel and the edges are turned over. Fitted with heavy steel wheels, hardwood frames, long handles, in fact the whole construction is thoroughly substantial.

PICK AND ROOTER PLOUGHS—
Nothing to break, bend, or get out of repair. Ten horses can be used without straining the parts.

Write us for catalogues

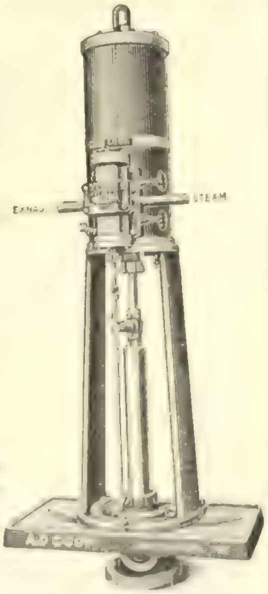
THE BATEMAN-WILKINSON CO., LIMITED
340 CAMPBELL AVE., TORONTO



Water Supply from Deep Wells

is obtained at a minimum cost by use of our deep well pumps.

Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer.



A. D. COOK

Lawrenceburg, Indiana, U. S. A.

Manufacturer of a Complete line of **DEEP WELL SUPPLIES** including Steam, Belt and Motor Driven **DEEP WELL PUMPS**, Wind-mill and Hand Pumps, Working Barrels and Valves, Pump Rods and Pump Rod Joints, Drill Rods and Drill Rod Joints, Drilling and Well Tools.

CATALOGUE MAILED UPON REQUEST.

The Consolidated Stone Company

Quarries and Mills at Bedford, Indiana, and Bloomington, Indiana

Producers of Dark Hollow Buff and Blue
Hunter Buff and Blue Oolitic Limestone

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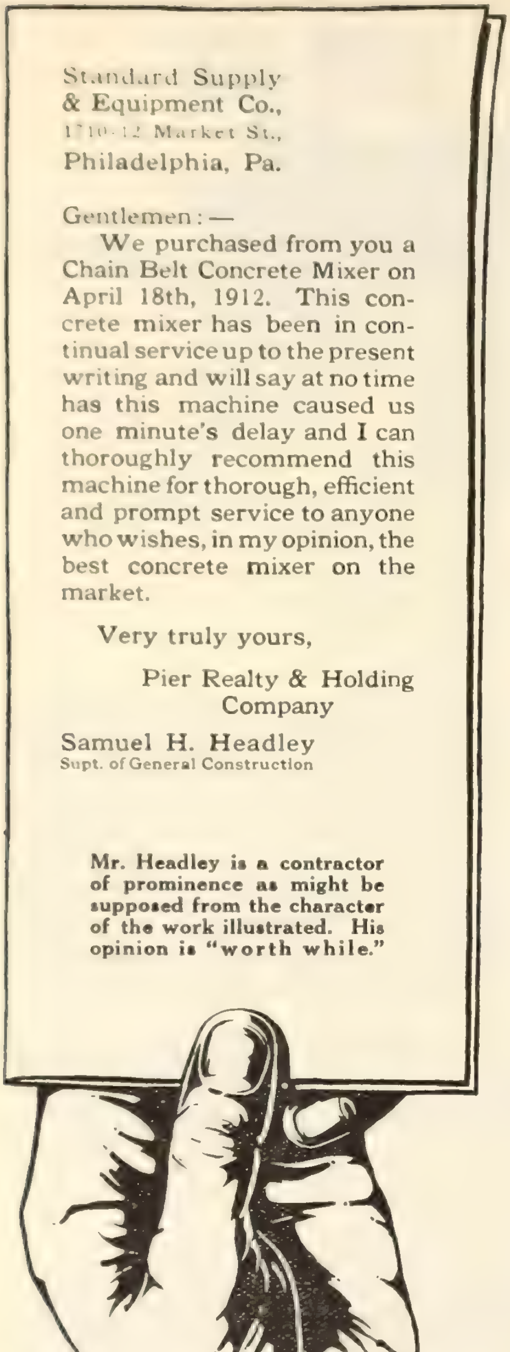

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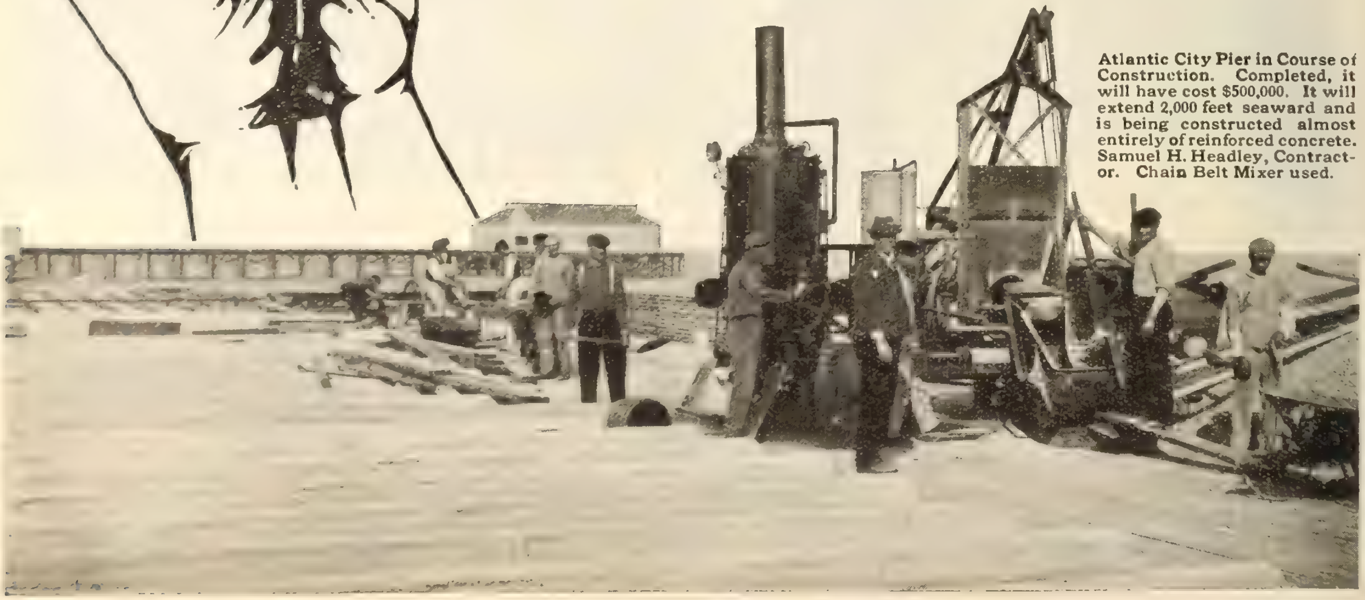

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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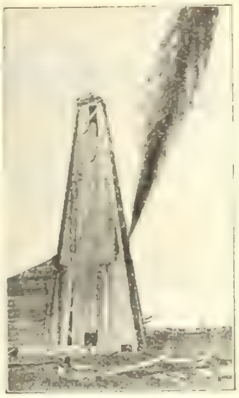

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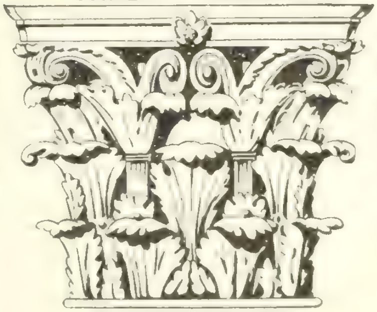

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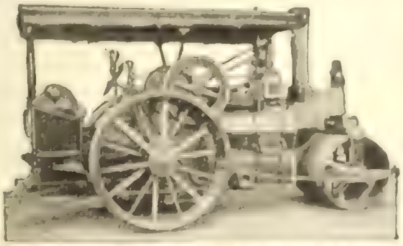

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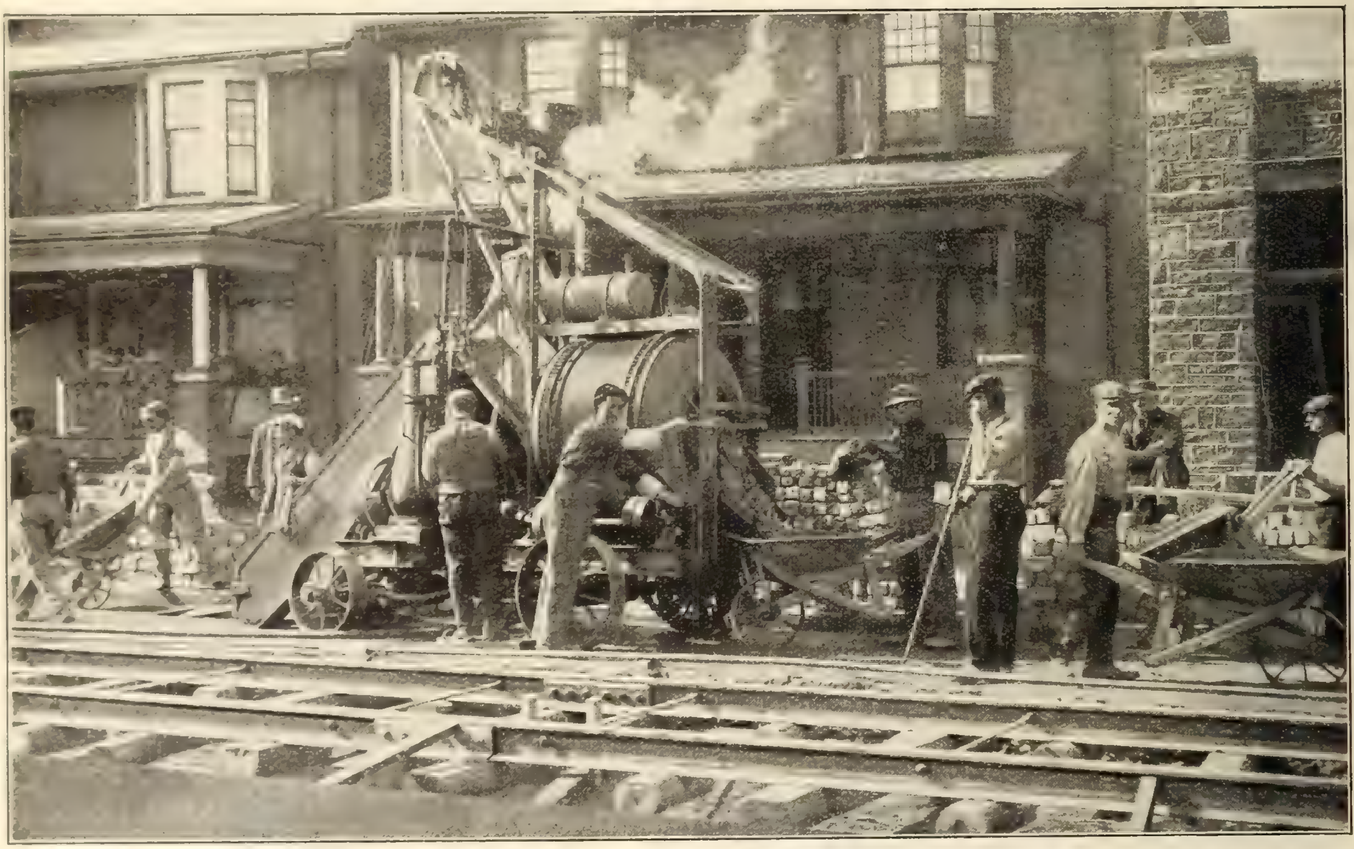

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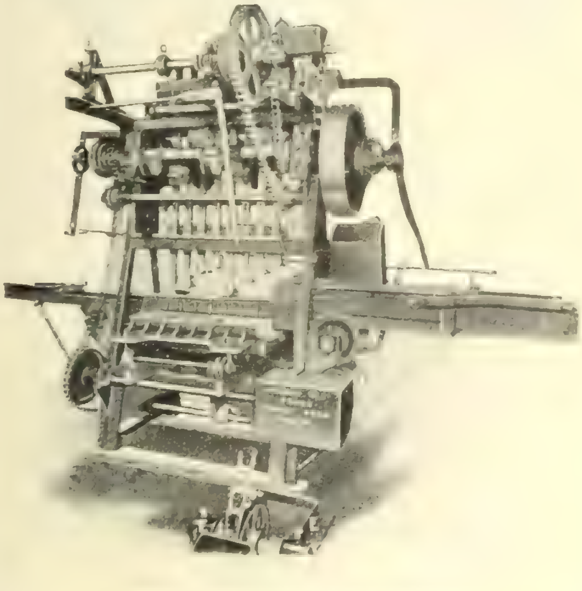

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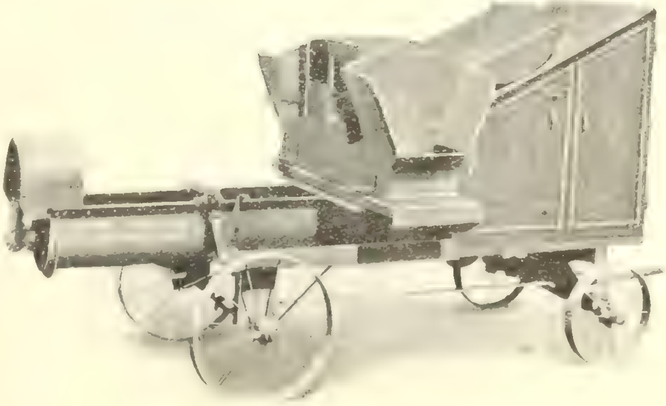

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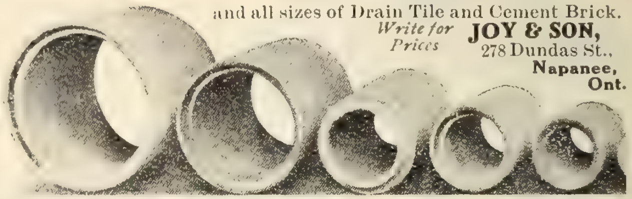

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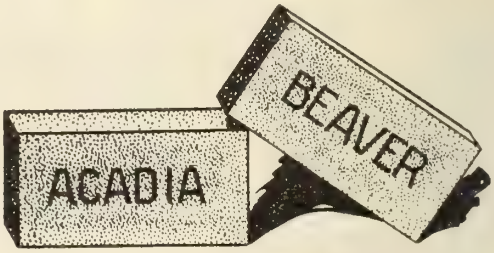

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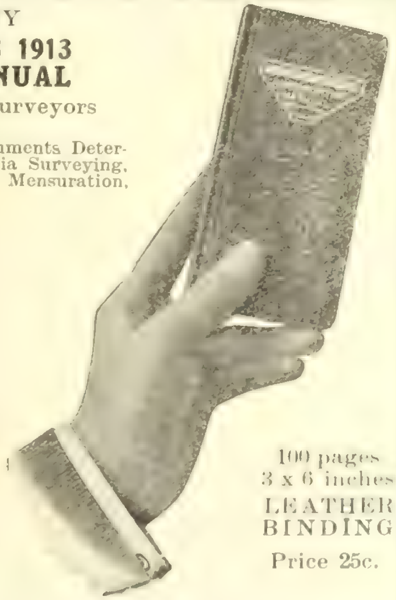

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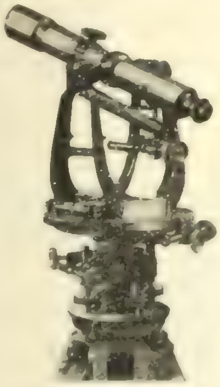

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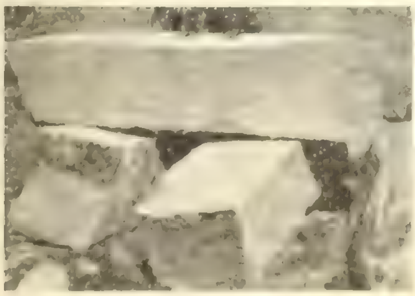

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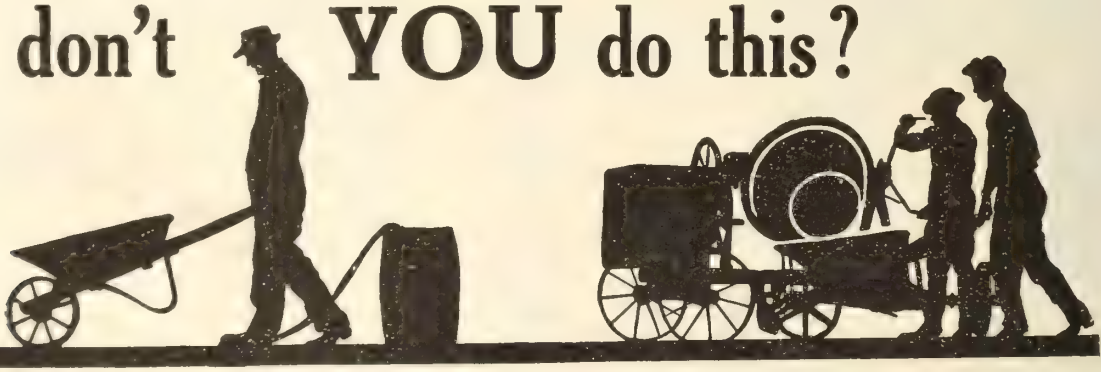

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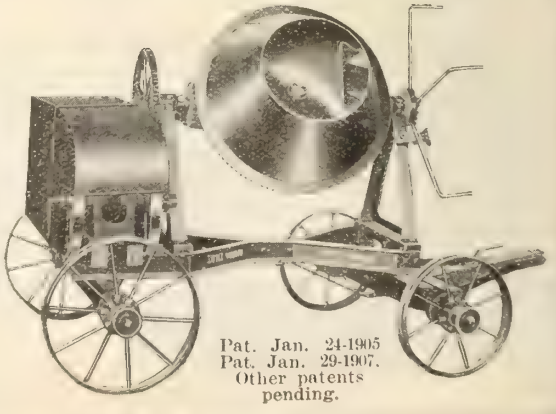

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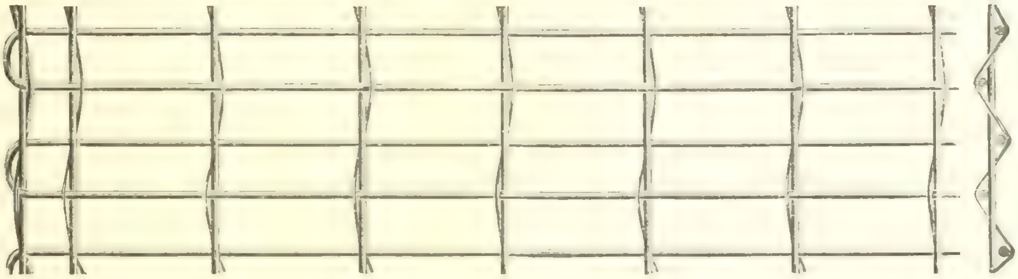

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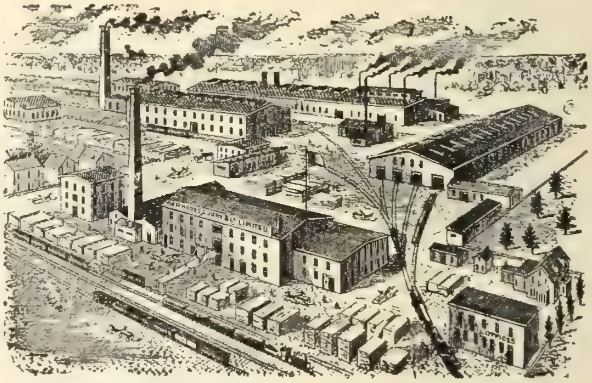

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3 inches to 60 inches diameter
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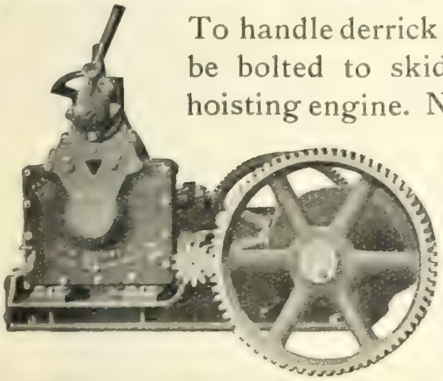

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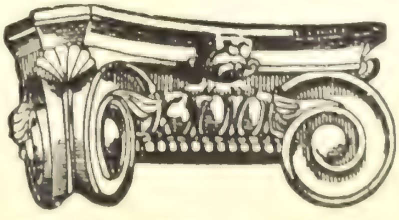

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- Sewer Pipe
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- Sacketts Plaster Board
- Parkers Corner Bead
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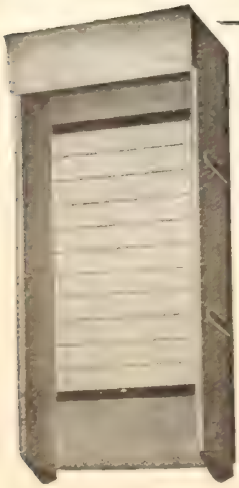

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Current Prices of Building Material.

BRICKS

The following are [illegible] prices delivered at Toronto.

	Per M
No 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
[illegible]	13 00
Wire cut bricks for foundation work ...	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

[illegible]

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

[illegible]

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

		Star	D.D.
10 to 25 united inches	....	$4 25	$ 6 25
26 to 40 "	....	4 60	6 75
41 to 50 "	....	5 10	7 50
51 to 60 "	....	5 35	8 50
61 to 70 "	....	5 75	9 75
71 to 80 "	....	6 25	11 00
81 to 85 "	....	7 00	12 50
[illegible]			15 00
91 to 95 "	....		17 50
[illegible]			20 50
101 to 105 "	....		24 00
106 to 110 "	....		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
[illegible]	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 in	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51 60	4 75	7 00
61 70		8 00
71 80		9 00
81 85		10 00
86 90		11 00
91 95		13 00
96 100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 15 per cent.; lead waste, $9.00, less 15 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 40 per cent.; pig lead, 5c lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

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Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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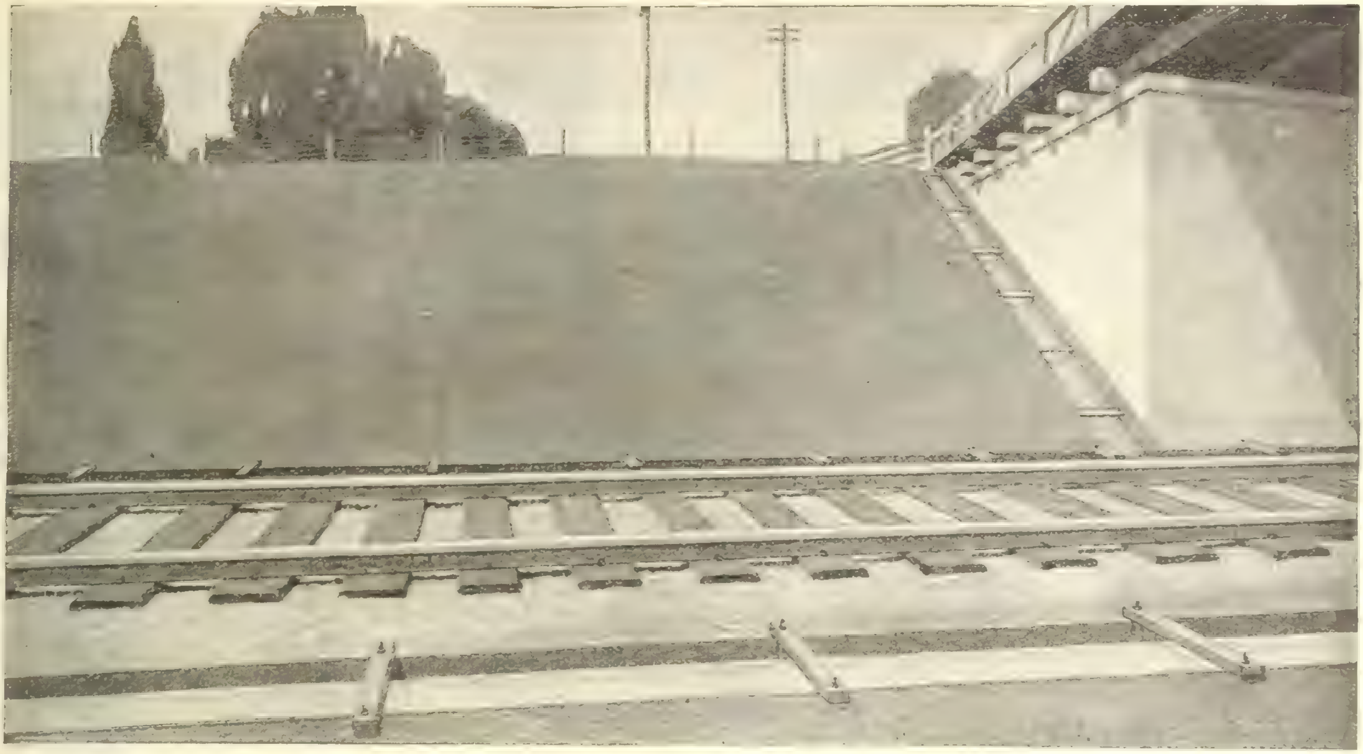

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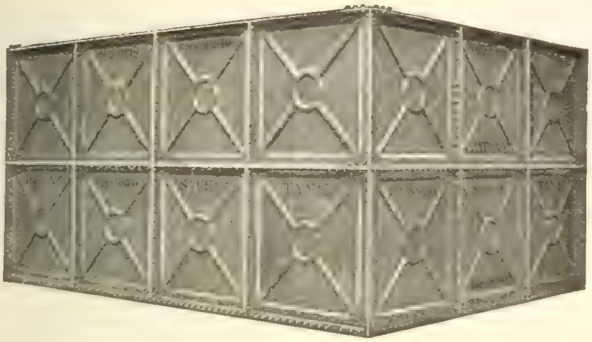

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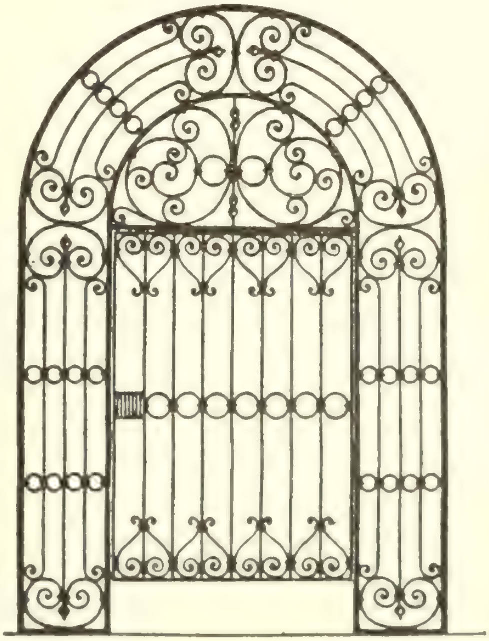

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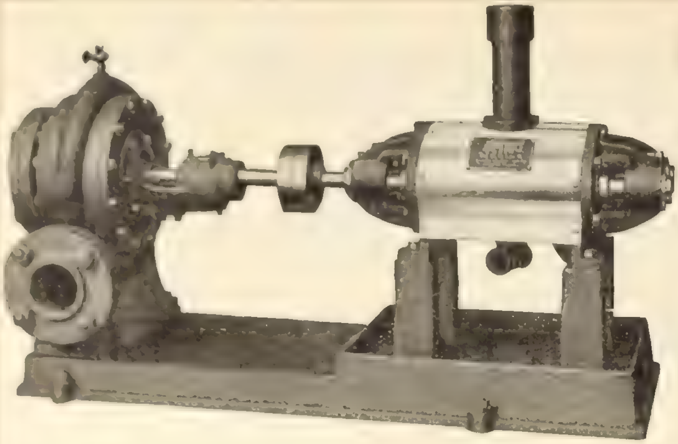

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For 15 years standard of their kind

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Combined with Easy Operation

This is accomplished by a single arrangement of gears, which so compounds the leverage in Barrett Geared Jacks, that heavy loads up to 40 tons are raised as easily as the ordinary typé of jack raises a light load.

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are designed for the rapid and convenient handling of freight cars, Passenger or Pullman Coaches, Locomotives, etc. They are made in capacities of 20 to 40 tons and a variety of heights. Simplicity of design and construction, and the absence of any complicated feattures insures freedom from maintenance and repair charges.

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Are made according to the specifications of the National Board of Fire Underwriters. The conductors are drawn from copper of the highest conductivity and are covered with two thicknesses of thoroughly vulcanized rubber compound of high quality. The wires are braided over insulation and the smooth high finish they receive makes them specially desirable for conduit work.

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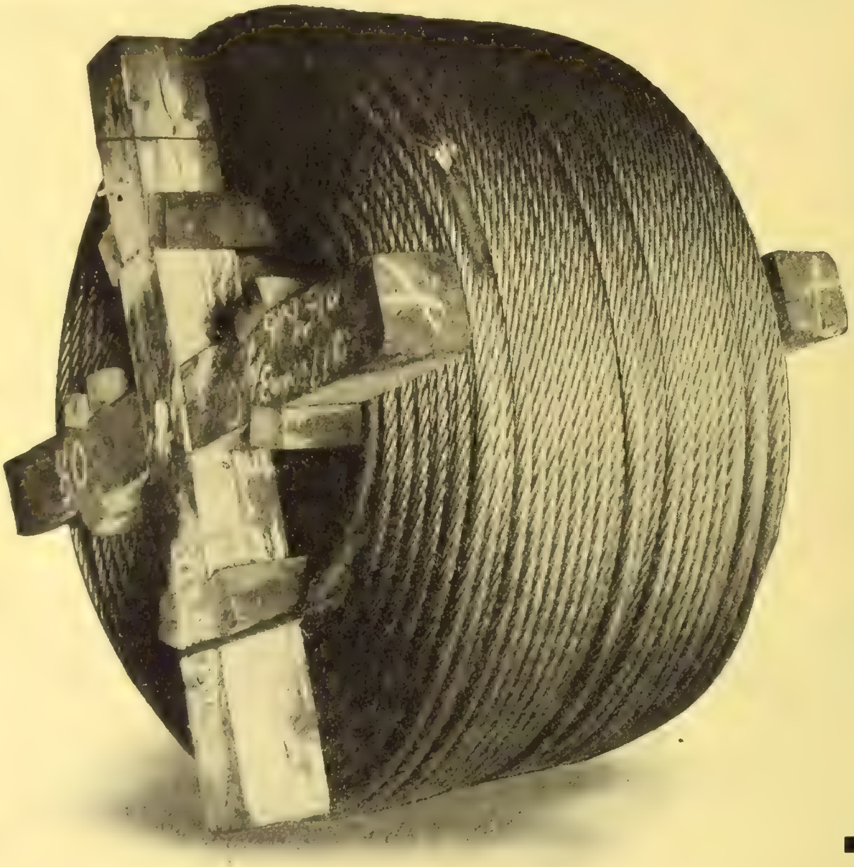

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We manufacture wire rope of every description for Elevators, Excavating Machinery, Dredges, Steam Shovels, Guying for Derricks, Ships, Etc., Hoisting of all kinds, Lumbering, Mining Rope, Oil Well Drilling, Bridges, Stump Pulling, Towing, Transmission of Power, Cableways, Tramways, Tiller Ropes, Etc., Etc.

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We carry in stock Wire Rope Fittings of all kinds including Blocks, Clips, Shackles, Turnbuckles, Thimbles, Sockets, Shears, Etc., Etc.

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Vol. 27 Toronto, May 28, 1913 No. 22

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps
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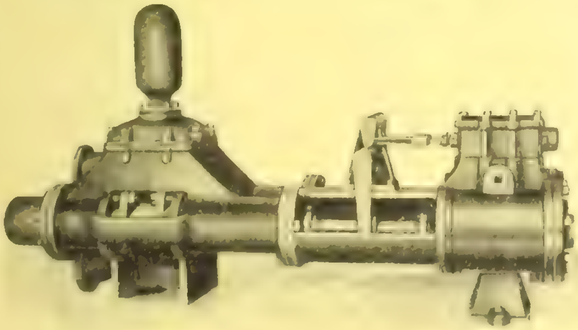

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Made in all
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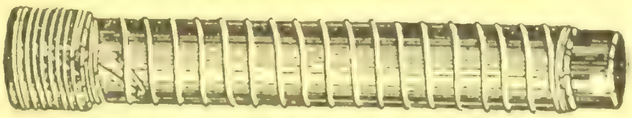

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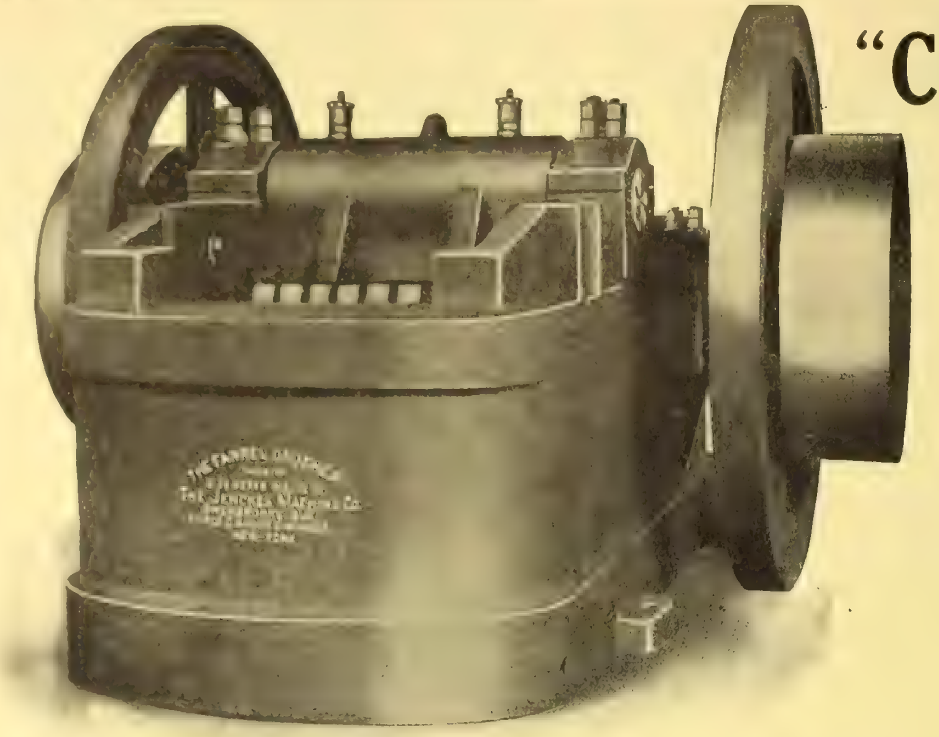

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Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

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into the hardest kind of service

"AMERICAN" Wire Rope Blocks

will prove their makings and materials every time.

They will safeguard the lives of your men, your expensive material and your equipment.

They cost no more than the cheap kind but they're worth more.

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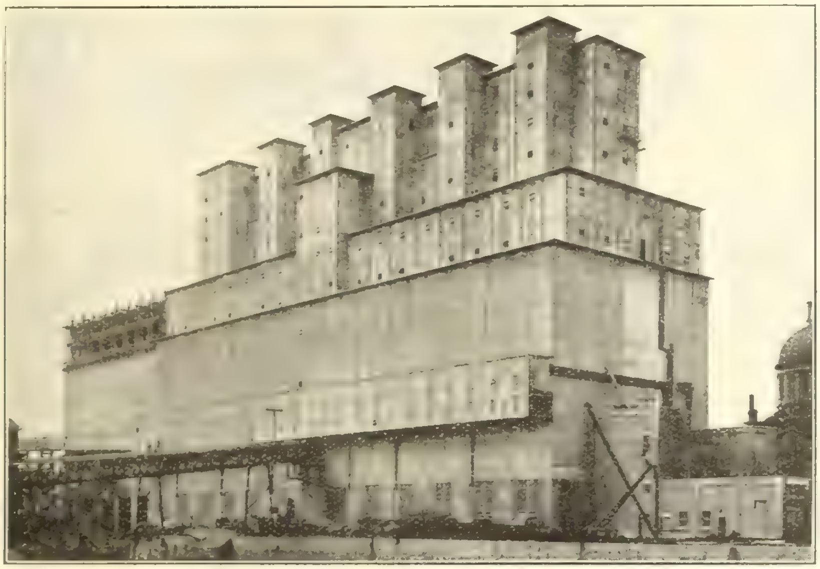

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The new grain elevator just completed by the Harbour Commissioners of Montreal, is one of the largest in the world. It has a capacity of 2,622,000 bushels, covers an area of 456 x 100 feet and is 242 feet high. Besides its immense storage capacity, it is provided with every facility for the proper handling of grain. Provision is made for unloading either from railroad cars or inland steamers and for loading ocean-going vessels for all parts of the world.

This structure stands as one of the greatest monuments to the progressiveness of the Harbour Commissioners of Montreal, and also to reinforced concrete, which material was used throughout. Canada Cement was used exclusively.

Canada Cement will satisfy your most exacting requirements, just as it satisfied the requirements of this great work.

Canada Cement Company
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Ever Had Any Trouble

With Crushing Rolls Due to

1 *Wearing in Grooves?*
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Are you interested in the best machine ever built for crushing stone to small sizes? If so investigate until you really know the facts regarding

The Symons Disc Crusher

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MUSSENS

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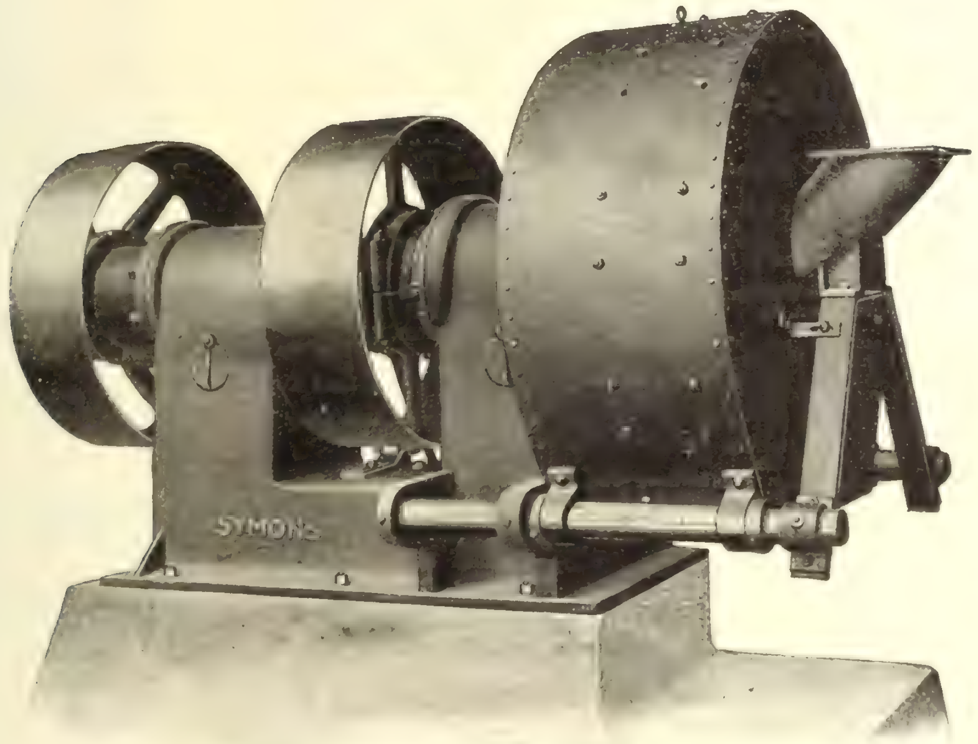

Will crush 40 tons of ¼ inch to 1000 tons of 2½ inch per 10 hour day. It Excels in Economy of Power, in Uniformity of Product and in the Low Repair Cost.

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(Continued on page 12)

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For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

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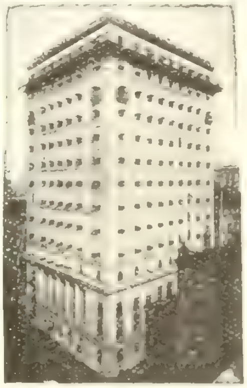
Don Valley Fireproofing, Bricks and Tile used throughout.



Traders Bank, Toronto
Carrere & Hastings and F. S. Baker, Associate Architects.
Don Valley Porous Terra Cotta Fireproofing and 2,000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

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Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Bell Telephone Building
Adelaide Street, Toronto.
W. J. [illegible], Architect. [illegible] Contractors.
Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

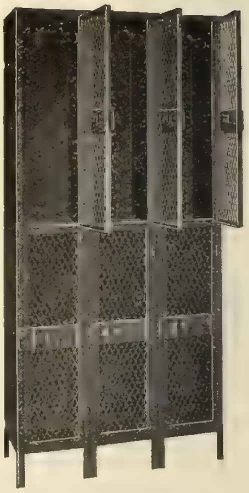
**"STEELCRETE"
STEEL LOCKERS**

**"STEELCRETE"
STEEL LOCKERS**

Locker Advantages

Wherever personal possessions must be left in the keeping of strangers, lockers provide the only really satisfactory arrangement of ensuring the safety of goods and the comfort of the possessor.

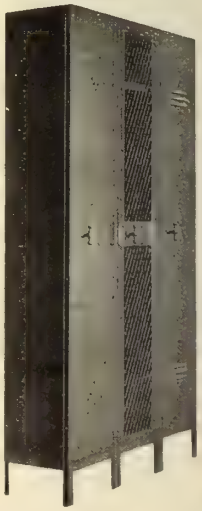
In waiting-rooms, dressing-rooms, cloak rooms, etc., lockers relieve those in authority of all responsibility of loss or damage and thereby form a permanent insurance against the many claims on property left in their charge.



"Steelcrete"
Steel Lockers

form a new type of safety lockers carefully thought out and designed and containing many advantages over the usual class of metal cage hitherto in use. These lockers are made all steel and are particularly suitable for

Warehouses, Gymnasiums, Schools, Clubs, Banks, Hospitals, Police Stations, Armouries, &c.



Steelcrete Steel Lockers are finished in olive green enamel and are exceptionally **neat** in appearance, **clean and sanitary,** and **solid** as a block of wood. They are constructed throughout of the finest high-grade steel and are unequalled for their Strength and Rigidity.

The Standard Sizes and fittings, etc., are carefully calculated to meet every ordinary requirement.

Made in "Single Tier" or "Double Tier" with sheet steel or expanded metal (open mesh) doors—combination locks or padlocks instead of rim locks if desired.

Write to Us—Our Prices will Interest You

STEEL and RADIATION
LIMITED

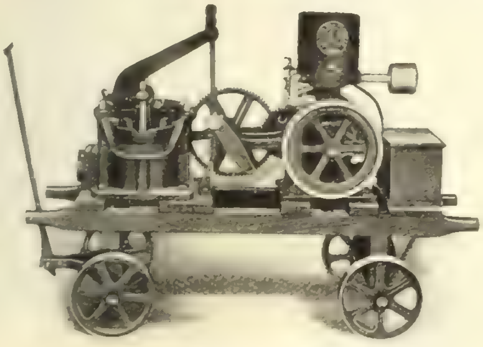
Toronto, Canada

**"STEELCRETE"
STEEL LOCKERS**

**"STEELCRETE"
STEEL LOCKERS**

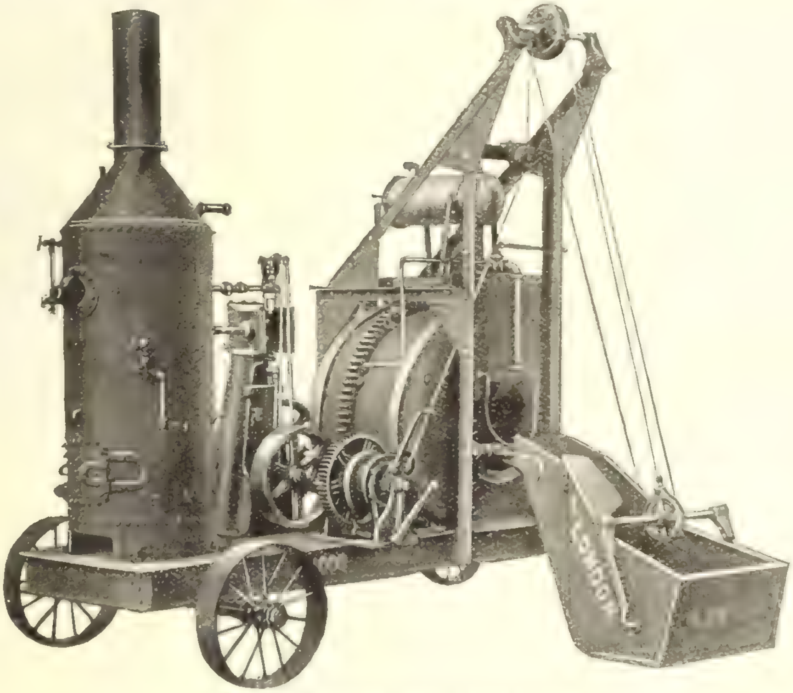
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.

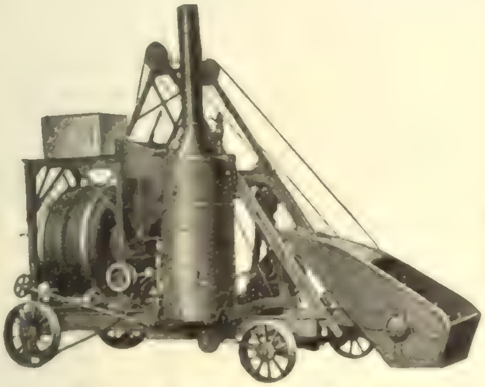


Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



London Standard Drum Batch Mixer
This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Cabell St. and Kitchener Ave., LONDON, ONT.

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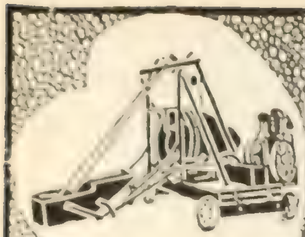
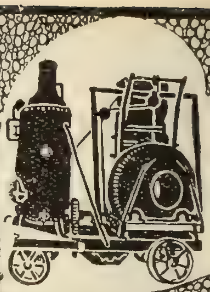
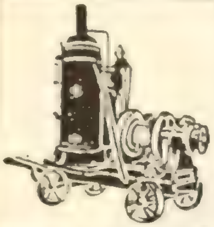
Wettlaufer Bro's IMPROVED CONCRETE & ROAD MACHINERY





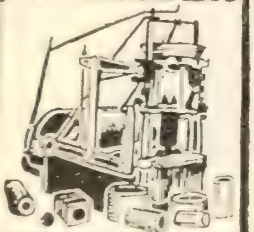
MIXERS

HOISTS



TILE MACHINES

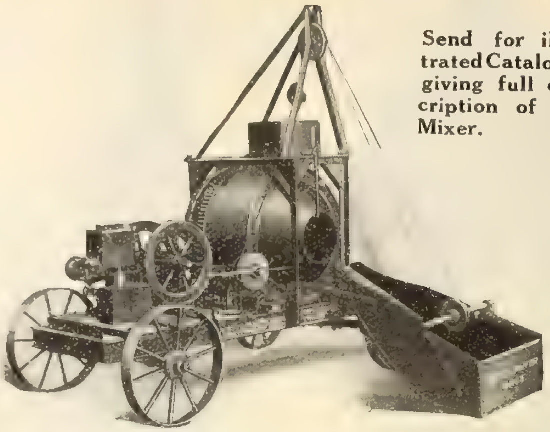
BRICK MACHINES



CRUSHERS

PUMPS

We cannot give you any idea of the perfection of this mixer in an advertisement. If you are interested come and see the mixer—it is worth your while.



Send for illustrated Catalogue giving full description of this Mixer.

The Wettlaufer Story

No. 5

Don't talk to me about spare parts—this time last year I was kept waiting over three weeks for a new bearing. Job held up—contract not finished on time—loss all the way round. What was my mixer? Well that's neither here nor there—I sold that mixer and I bought a Wettlaufer Heartshape. No trouble of that kind now. They keep spare parts **always in stock,** in all of their agencies and warerooms.

THE WETTLAUFER HEARTSHAPE MIXER

does away with spare part trouble—and that's a big item.

Not only will all your Mixer troubles end, but your equipment efficiency will increase if you use a Wettlaufer Heartshape Mixer.

COME AND SEE OUR MIXERS WORKING
— CONTINUOUS DEMONSTRATIONS AT

Wettlaufer Brothers

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

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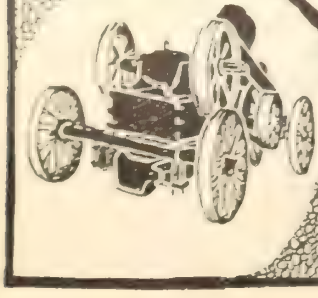
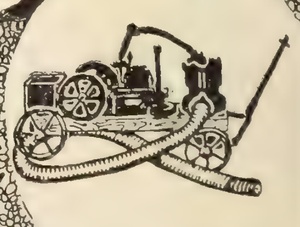
Montreal Office and Warerooms: 316 Lagauchetiere St. W.





THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

Orleans Filtration Plant and Concrete Building taking about 100,000 barrels of Alsen's New Cement

Alsen's Cement

was selected in 1905 for the Panama Canal in preference at equal prices and has exceeded those severe requirements. Sold under a guarantee other Portlands cannot make in good faith. Other brands have been supplied only on modified specifications.

Alsen's American Portland Cement Works
45 BROADWAY, NEW YORK

THE Underwood embodies in one machine all that can be expected in a typewriter. It is sold at the price which should be paid for a machine of its quality.

United Typewriter Co., Ltd.
All Canadian Cities

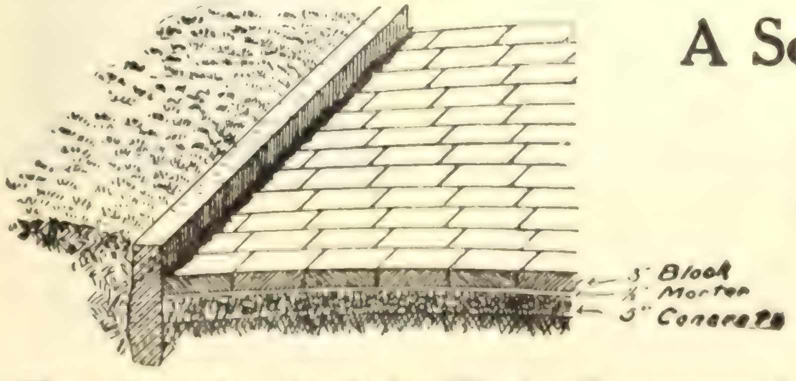
"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL



A Scientific Pavement

must be

Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and Easily Cleaned.

These requirements are met by
Asphalt Block Pavements
Send for Descriptive Literature

The Ontario Asphalt Block Company, Limited - Windsor, Ont.

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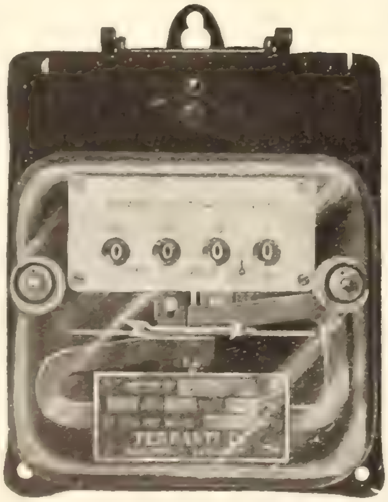

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Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
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Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

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Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

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Limited
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Busy Contractors Use New Model Aurora Dump Wagons

because they want wagons that will haul the most material in the least time and that are on the job every working hour.

A novel feature has been added to this wagon which places it beyond comparison with any other on the market, namely, **a steel channel filled with wood for the main side board,** giving unusual strength. This is the portion of the wagon that stands the heaviest strain, With this reinforced side board, breakage is practically impossible. It is short coupled and built low. Light in weight. **Write today.**

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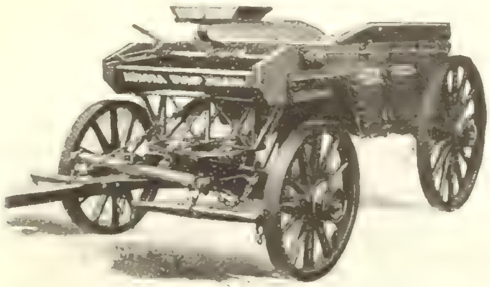

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.

Hagersville, Ont.

Limited

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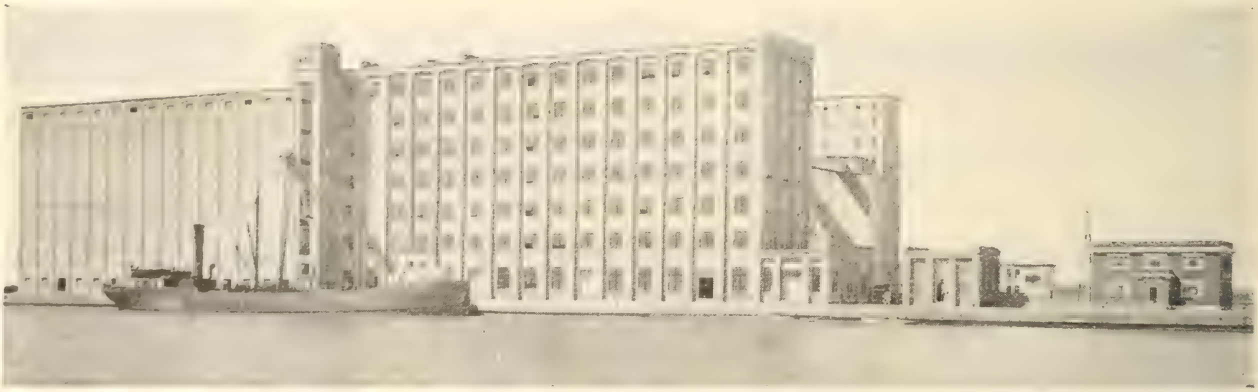

The Maple Leaf Elevators, Port Colborne. J. H. Tromanhauser, General Contractor.
80,000 sq. ft. Barrett Specification Roofing on this building.

This building is but one of the many large contracts executed by us.
Our years of experience and large equipment are such as to enable us to handle these large contracts with promptness.
We can include for any specification along the lines of a Built-up Roof, Damp-proofing foundations, sub-floors, etc.
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Send along your plans and specifications at our expense, we will quote you a close price and return them promptly.

REGGIN AND SPENCE
Roofing and Sheet Metal Contractors
530 Front Street West · Toronto

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Preserves Roads
Prevents Dust~

Beaurepaire Road, Beaconsfield, Quebec. New macadam road treated with two coats of "Tarvia B."

A Splendid Tarvia Highway

THE above photograph shows one of the many fine new roads in the Dominion which have been bonded with Tarvia to give a clean, strong, waterproof surface. The Tarvia work in this instance consisted of a treatment of two coats of "Tarvia B," which is the lightest and the cheapest kind of Tarvia treatment.

At a trifling expense, Beaconsfield thus secured a road surface capable of standing the traffic and needing very little maintenance. The saving in maintenance in itself will balance the cost of the Tarvia treatment. In winter or summer this road will give swift and easy traction. The Tarvia-bonded surface will shed water and the surface will afford good footing.

Progressive communities all over Canada are learning the value of Tarvia as a road preservative and dust layer.

"Tarvia B" requires no heating for application and may be applied from a sprinkling cart at trifling expense. Other grades of Tarvia of greater density and tenacity are "Tarvia X" and "Tarvia A," used in road construction work.

Booklets free on request.

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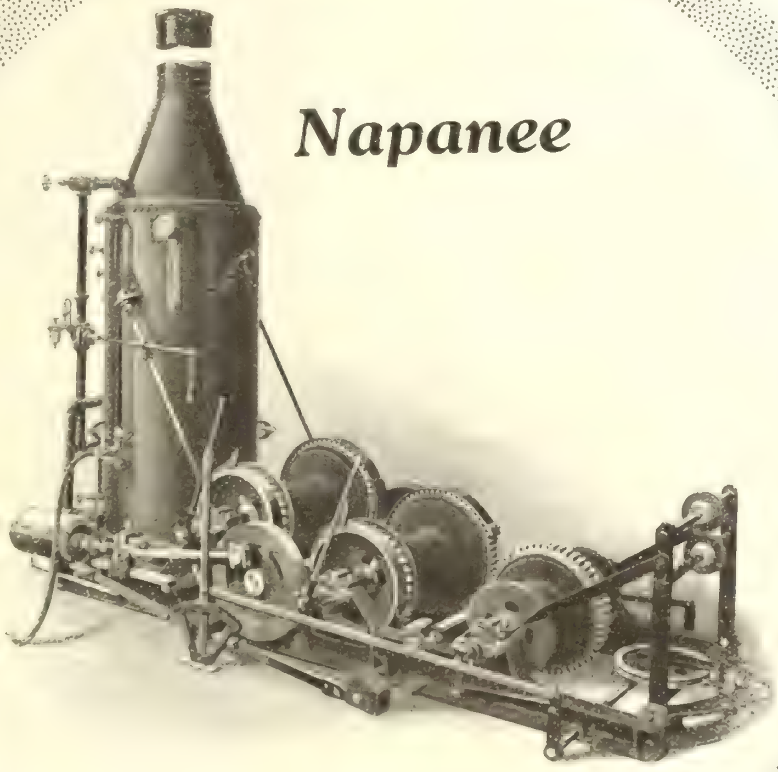

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Napanee, Ontario

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SWANSEA

Salt Glazed and Vitrified

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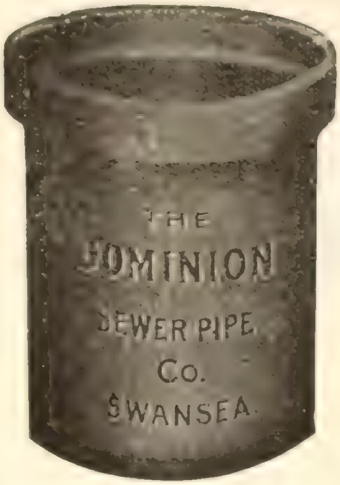

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Sizes manufactured and always in stock 4 in. to 24 in.

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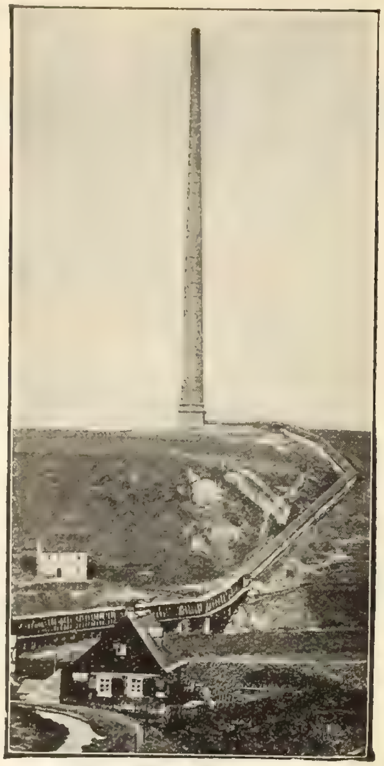
PARK 1809

The Dominion Sewer Pipe Co.

(The Independent Co.) **Limited**

SWANSEA (near Toronto)



460 feet x 8 feet 2 in.

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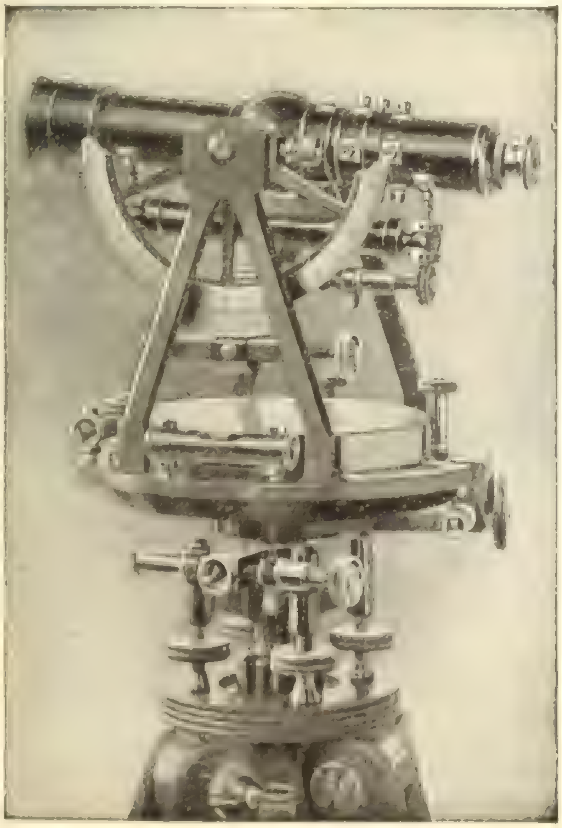

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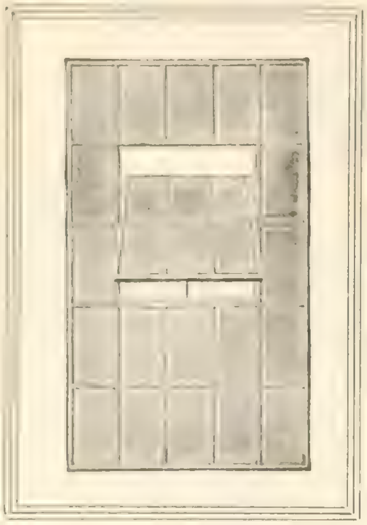

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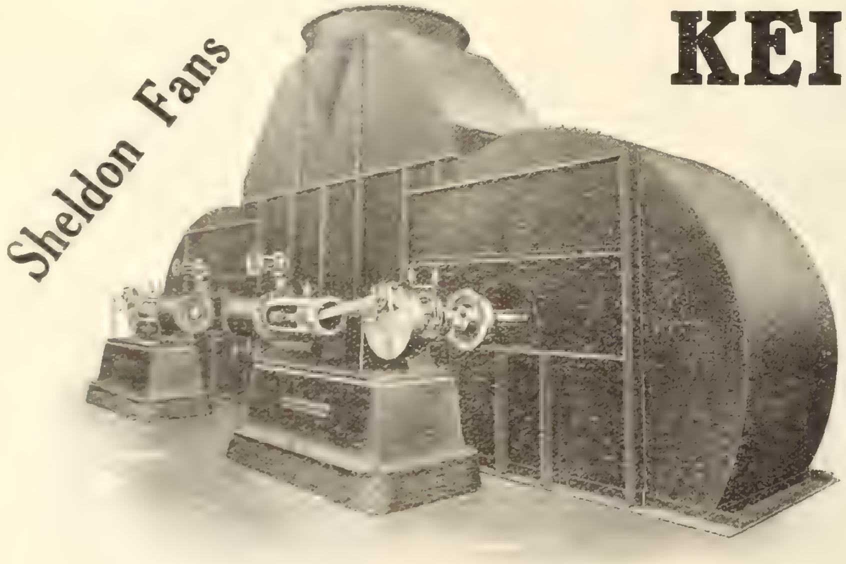

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Non-Freezing and Fumeless.

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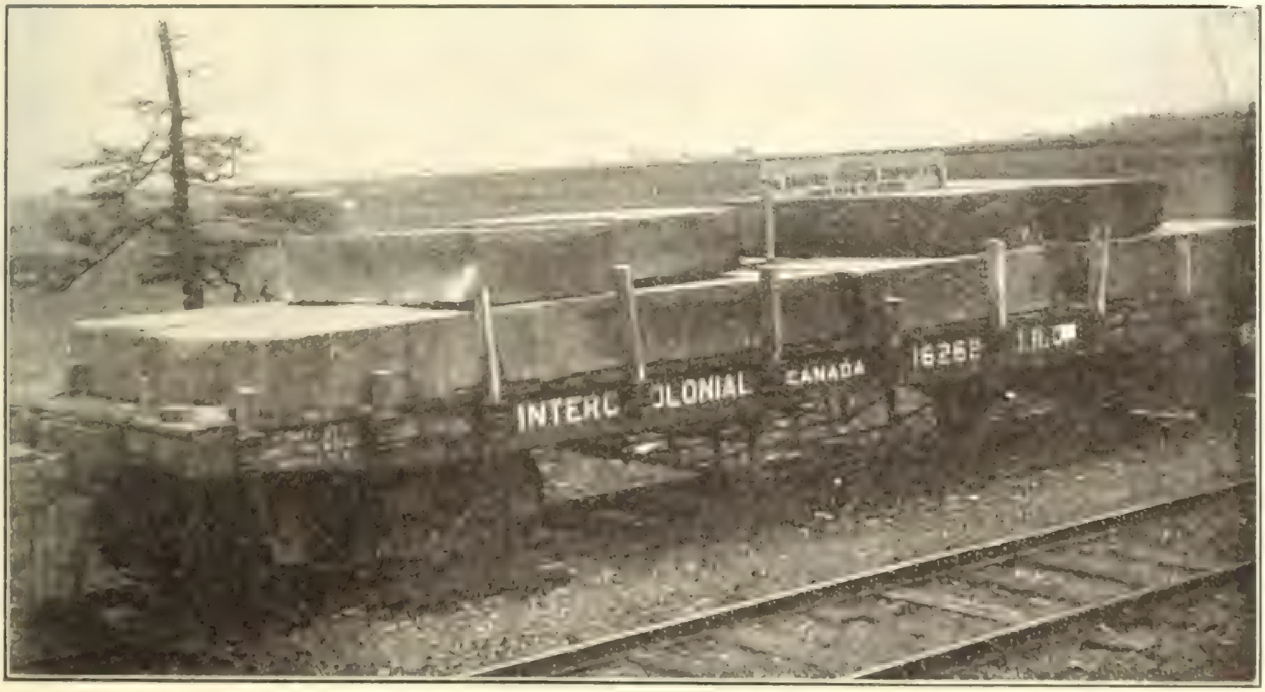

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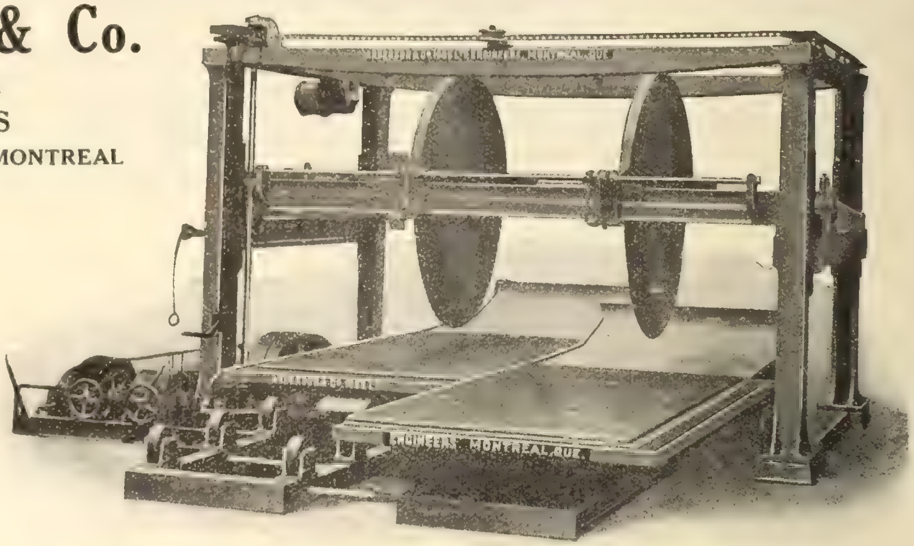

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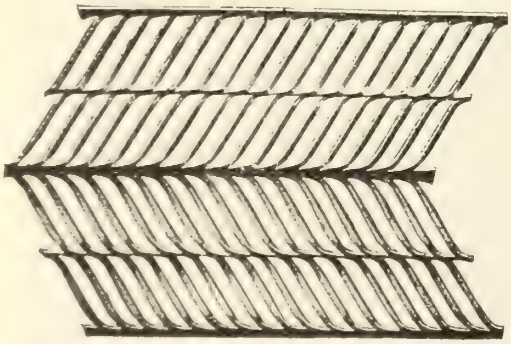

has a selvage edge of ruler-like straightness. These selvages interlock, making wiring between studs unnecessary. Lapping of sheets with Herringbone Lath, instead of being necessary is a detriment.

The sheets are 1½ inches longer than the invoiced eight feet, so end lap is secured without expense.

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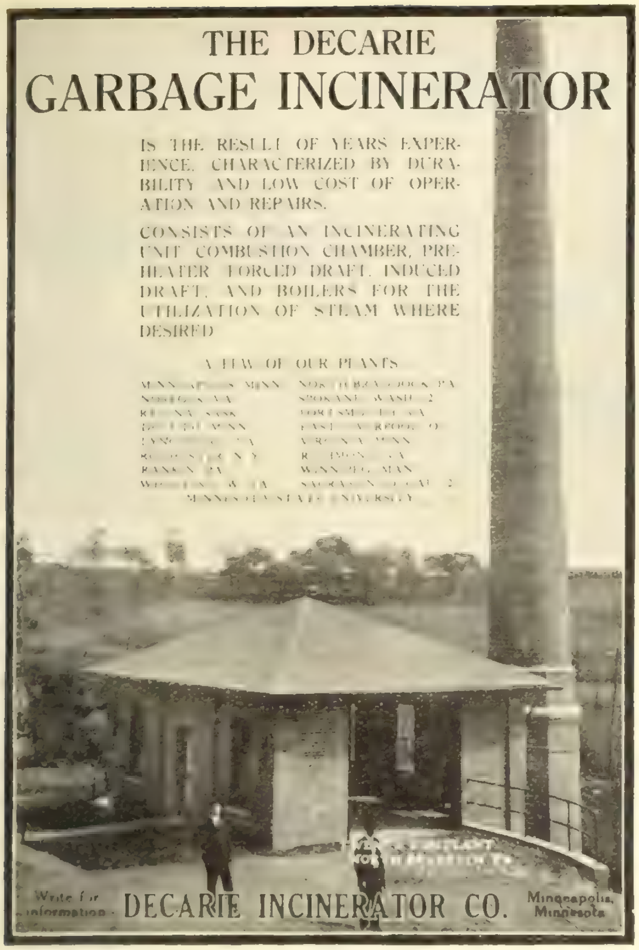

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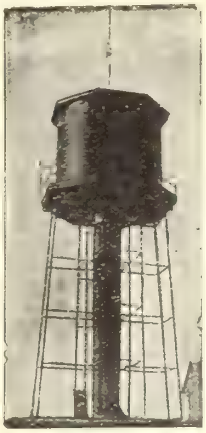

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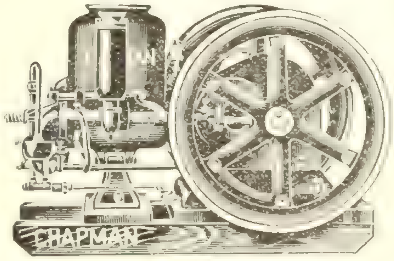

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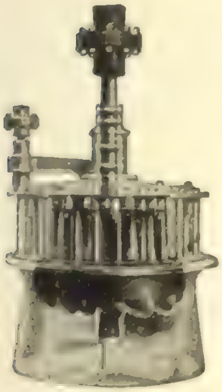

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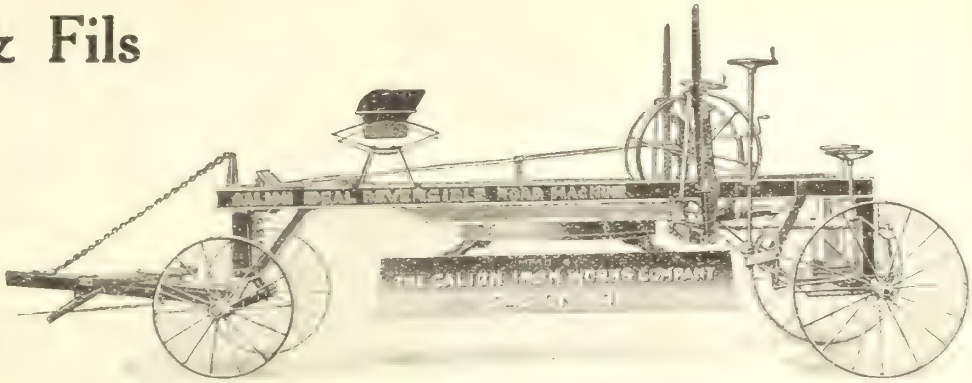
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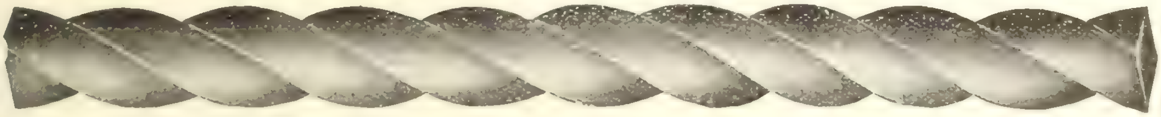

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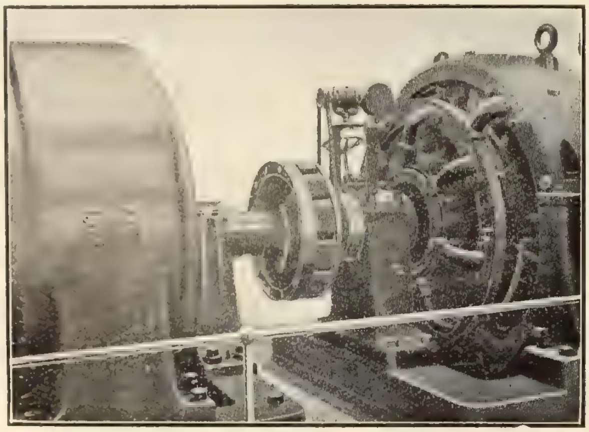

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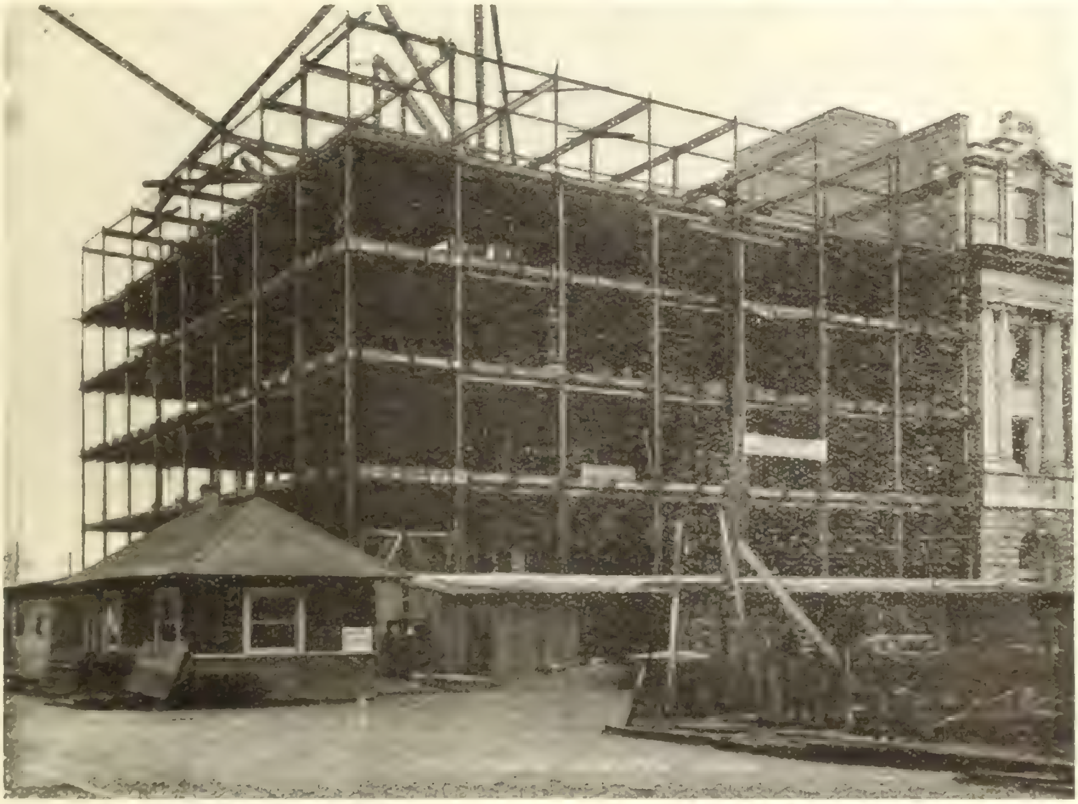

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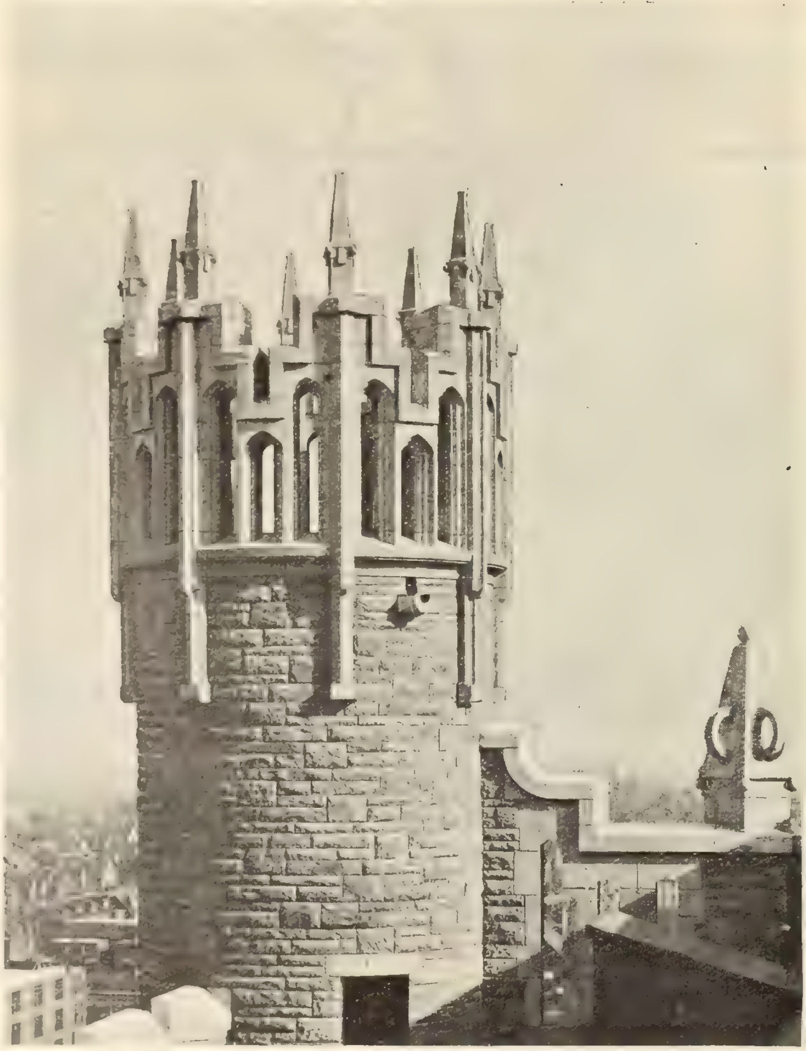

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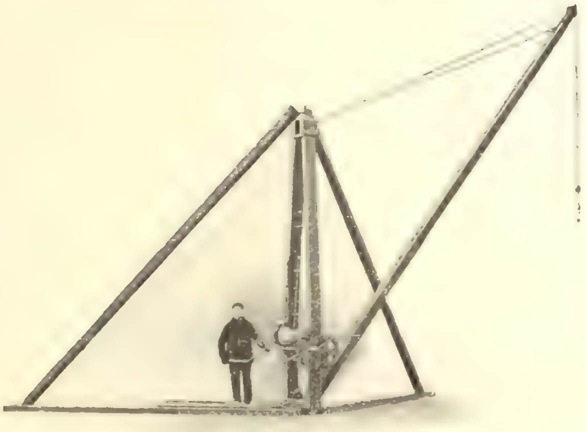

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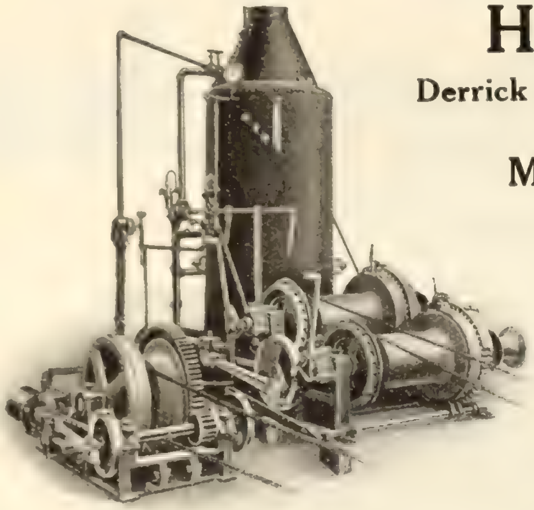

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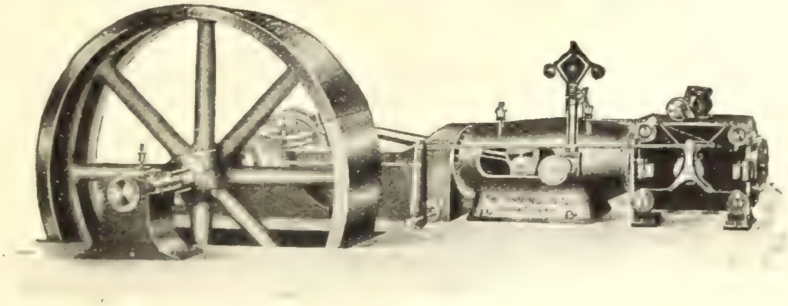

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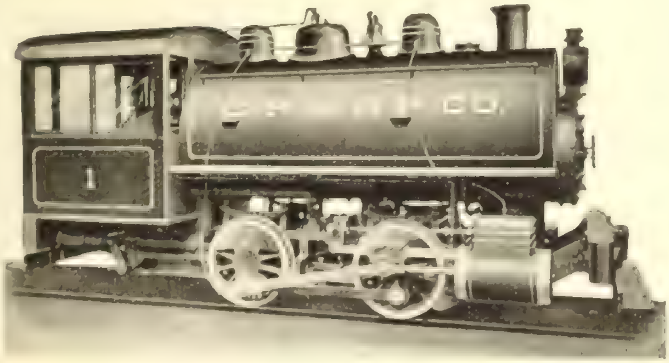

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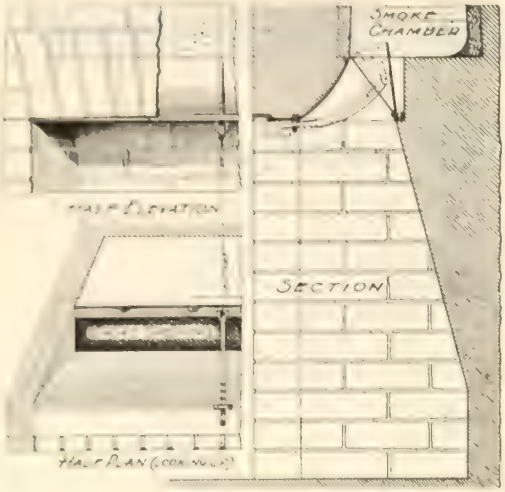

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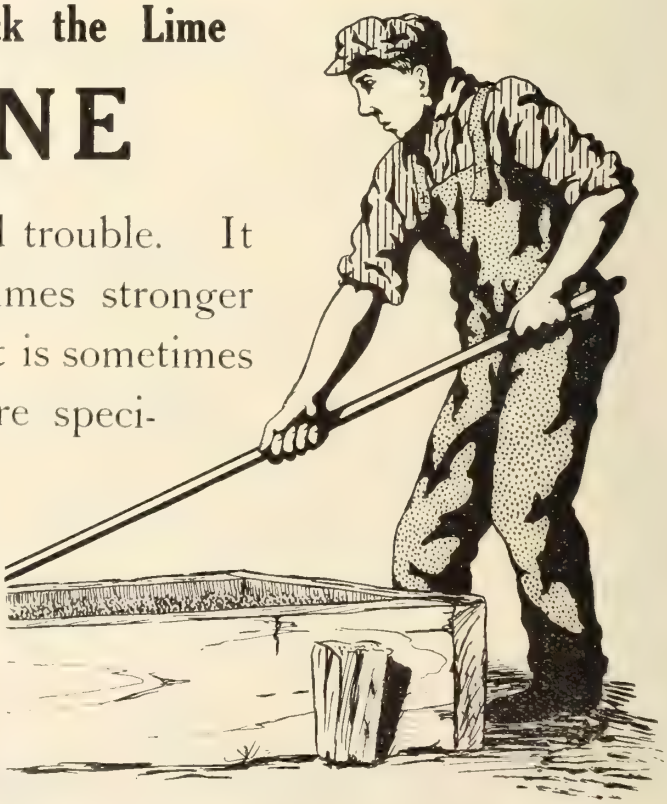

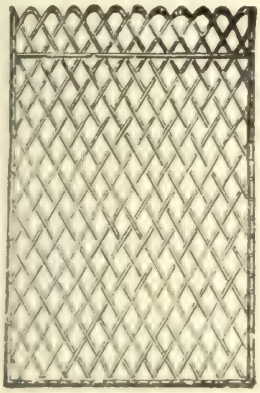

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Vol. 28 **May 28, 1913** **No. 22**

The National Spirit

THE national spirit of the United States and Canada, as contrasted, has been the subject of not a little discussion in the newspapers on both sides of the border. The subject is of such general and at the same time individual interest that some reference to it in these columns is justified. The bone of contention is whether the Canadian should "foster a consciousness of the race from which he came," calling himself English, Scotch, Irish, etc., or whether he should find sufficient gratification unto himself to halt at calling himself a Canadian. While we are inclined to think that those who have contended most strenuously against the jingo spirit of imperialism have in turn somewhat overdone the "Canada" sentiment, we are certainly disposed to encourage any movement making for unity, for in unity there is strength. The following argument, presented in an abstract from a Rochester, N.Y., paper, is not without merit, although we are inclined to regard the allusion to Canada as "the appendage of a European power," as rather lacking in taste.

"It is said by those who urge the development of a distinctive Canadian spirit that now no one but the aboriginal Indian has the right to call himself Canadian, since the census itself perpetuates a system of reference to the extraction of citizens. Not even the residents of the province of Quebec, who have been there for three centuries, are permitted to be Canadians, but are classed as French.

"This is very different from the spirit that one sees in the United States, where may be found a just pride in racial descent or in the state in which one chances to be resident, but where the chief cause of complacency is in being American. It may be doubted that Canada, being the appendage of a European power, can develop as intense a national spirit as is felt here, but it is clear that she can assume an attitude that will accomplish something in that direction.

"Instead of looking backwards and across seas, Canada might well turn her eyes forward and let her great inspiration be the forces within herself. While this might seem a departure from sentiments of mother-country patriotism about which great brag is made, it would be eminently more respectable than the present attitude, and might be expected to result in a new sense of unity and a new strength throughout the broad territory of the Dominion."

Public Funds Demand Competitive Business

THE representative of an English company, a New York firm, protests because it was not afforded an opportunity to tender on a garbage plant at London, Ont., upon which some $40,000 was ultimately spent. From the investigations that have been made it would appear that contrary to the advice of the city engineer the city council awarded a contract involving the above sum without going through the formality of inviting tenders. Now the city of London awakens to find that it has installed a 50-ton incinerator for $40,000, while Calgary has installed a 106-ton incinerator for $50,000. The local papers are devoting columns to the details of the contract, but that, of course, will end in the nothing that all such things end in—unless there be fixed an amount above which it shall be compulsory for the city to advertise tenders. It is not for the contractor to expound the ethics and principles of business to the municipality; it is for him to make the best contract at the best figure. Cities, however, entrusted as they are with the monies of the community, are more directly concerned with living up to an established principle. They are not called upon to exercise ingenuity or enterprise in the award of their contracts but only to give them due publicity and to place the work in the best interests of the city. If the city council of London expended $40,000 on the purchase of an incinerator plant, restricting its dealings to one firm, we contend that it took almost a criminal liberty with the public funds.

Defective Building Codes

Canadian cities that are considering the revision of their building code may well take a leaf out of the book of New York City. There a commission has just been appointed to revise the building code and $15,000 has been voted to cover the expenses of the investigation. It is generally felt that this sum is an altogether inadequate one and in all probability the amount will be doubled.

Comparisons are odious and it were ill-advised to place the activities of the Canadian city beside those of New York, but while the building code of New York regulates a wider range of building operations than that of, say, Toronto, the principles governing the construction are common to both codes and the same care and expert knowledge are demanded of the investigators in either case. New York is famed as a city of up-to-date methods in building construction, but its code upon examination is found to be very defective. In buildings of a steel skeleton, for instance, there are arbitrary requirements in regard to increasing the thickness of the exterior walls at certain intervals from the top down. In this connection it may be of interest to quote the editorial criticism of our New York contemporary, the Engineering Record:

> The centers of the steel columns for this type of construction are always established at a fixed distance from the outer face of the walls, and this distance is taken at an amount such that the exterior walls will give the necessary fire protection to the columns and wall supporting framing. At a point 75 ft. down from the top the walls are increased 4 in. in thickness, and they are further increased 4 in. for every additional 60 ft. or fraction thereof of height. These increases are all added to the inside of the walls, thereby giving no increased fire protection for the steel frame from fires on the outside. Moreover, no increased protection for the steelwork from a fire on the inside is thus provided, for the steelwork must be protected from the interior, according to the requirements of the code, by suitable protection provided especially for the members of the frame.
>
> If the outer walls of buildings were solid, without openings for windows and doors, they would be of great assistance in resisting wind and other lateral forces. But they are far from solid; in the lower storeys of buildings of the best class the entire wall will be replaced by glass and sheet metal. The code requires that the steelwork shall be designed to resist all wind and lateral forces. It is not logical, therefore, to require increased wall thickness for this purpose.
>
> The increased wall thickness is very expensive to the owner for many reasons, but chiefly because of the great amount of steel required to carry them, the loss in floor space which they entail, and the excessive size of the grillages which they are sure to make necessary.
>
> One of the worst effects of the requirement of increasing the thickness in the skeleton wall for buildings is to encourage the excessive use of curtain walls. That there is discrimination in favor of curtain walls may readily be seen. According to the present code, the requirements for the thickness of walls of the two classes are practically the same. The curtain wall is assumed to carry its own weight, but is made to depend for lateral stability on its connection to the steel frame, no increase being required in the steel frame to supply this lateral support. The load brought on the foundation bed under the footings of curtain walls cannot be properly distributed, as the footing cannot be made central with respect to the wall when the face of the wall is on the property line; moreover, the unit pressures are generally not the same as used for the steel column footings. In those locations where the wall footings cover the footings of wall columns the problem of making a uniform distribution of load on the foundation bed is practically impossible. Buildings with curtain walls, therefore, due to the lack of unity between the walls and the remainder of the structure, are likely to develop cracks in the walls and cracks in ceilings and floors adjacent to such walls.

Here is a strong case against one important requirement of the New York code. Arguments of equal weight can be brought against other sections. And this in a city that professes to live up to the minute in building construction.

Canadian cities certainly have a great responsibility in framing and keeping up-to-date by-laws embodying principles of construction that ensure absolute safety and at the same time call for the minimum expenditure. The framing of a code which fulfils all the requirements is the work of experts and should be paid for in corresponding terms of dollars and cents. In the constructional field there are constant changes which entail almost continuous work.

It will be interesting to follow the work of the commission that has been appointed at New York and in due time to make a careful comparison of the main requirements of their revised code with that of Toronto, a city whose building activities last year represented the expenditure of nearly thirty million dollars.

Building code requirements should furnish a topic for interesting discussion in the pages of this journal and we invite our readers to point out what they consider outstanding defects in the regulations which govern their constructional operations.

The Ottawa Appointment

IN recording the appointment of Mr. Archibald Currie, of Westmount, to the office of City Engineer of the Federal Capital, we extend our hearty congratulations not so much to Mr. Currie as to the city of Ottawa.

It is now nearly six months since Mr. Ker resigned. This is rather a long time for the Works Department of the capital city of the Dominion to be without an administrative head, but for once we believe that the city council of Ottawa were right. The history of civic administration at Ottawa is an unfortunate one and the series of short-sighted blunders which terminated in the waterworks investigations made the prospects for a new city engineer anything but attractive. Time, however, has a healing influence, and most of the acerbities have been removed in the half-year that has elapsed.

Ottawa has been notoriously mismanaged by the council for years, but there is no reason why such an unsatisfactory state of affairs should be perpetuated, and it is to be hoped that the appointment of Mr. Currie, a distinguished engineer with a world-wide experience in engineering and contracting, will see the commencement of a new era at the Ottawa City Hall.

Experiment With Vitrified Clay Pipe

Engineers employed in the construction of new wharfs at Terminal Island San Pedro, Cal., have been experimenting with considerable success, with vitrified clay pipe as a protection to piles, from the destructive parasites, according to "The Architect and Engineer." It has been the custom heretofore to creosote the wood piles to protect them from the ravages of the teredo and linoria. This process is expensive and by the use of vitrified clay pipe it seems that the problem of securing a less costly substitute has been solved. The wooden piles are covered with 14 or 16 in. clay pipe, the pipe being placed over the piles as soon as they are driven, and allowed to sink with their own weight into the mud at the bottom and the space between the pile and the pipe filled with sand, which is particularly disliked by both the parasites mentioned.

Water Supply and Sewerage Problems[*]

The Fifth of a Special Series of Articles—Water Carriage and Substitutional Systems—Introductory to a Discussion on Sewage Disposal

By W. Muir Edwards, M. Sc., C.E., Professor of Civil and Municipal Engineering in the University of Alberta.

IN the urban growth of a municipality the density of population, which makes a public water supply imperative, also forces the town fathers to substitute for private effort a publicly owned and controlled system of collecting and disposing of the waste of the community life. As the town builds up, on lines usually laid down with absolutely no regard for natural drainage conditions, it is also necessary to provide a collecting system and outlet for the storm water. Otherwise, good roads would be impossible and great inconvenience and property loss might be inflicted upon the inhabitants.

In practice the wastes of civic life are divided into two classes. Garbage, ashes and similar refuse form the first, whilst human excreta, together with the waste liquids from the kitchen and laundry, form the second class. It is the collection and disposal of this latter class, together with stormwater drainage, to which the term "sewerage" is commonly applied.

In many cases it is the collection and disposal of human excreta only that first and for some time in the town's growth, engages the attention of the council. In the early days of community life the land is depended upon to dispose of the waste products of the household. But it is merely a matter of growth and corresponding density of population until the removal of at least the sanitary sewage will be demanded, both on the grounds of public health and also on that of convenience. In dealing with the problem when it does arise there are two essential demands that must be satisfied. The first is that "the sewage and all the sewage should be removed without delay to a point remote from human habitation," and the second is that "the sewage shall be so disposed of as to lose its power for evil."

In the collection, as in the disposal, it must be borne in mind that the power for evil in the excreta is represented by the minute forms of life termed bacteria. Pathogenic or disease-producing bacteria are bred in large numbers in the affected organisms in many diseases such as typhoid, cholera, dysentery, etc., and are thus present in the excreta of patients suffering from such diseases. Should the excreta remain in the neighborhood of human habitation, the bacteria may be transferred by numerous agencies, the common house fly, for instance, and, finding their way into the system of a healthy person, cause a spread of the disease. In cases of wide distribution the result is an epidemic. The objection on aesthetic grounds against the retention of the sewage in the neighborhood is also a valid one and should not be overlooked. "Fresh sewage, if not taken into the stomach, is neither injurious to health nor very offensive to the smell, but from putrescent excreta and kitchen slops come those noisome gases which, if not in themselves bearers of malefic germs, at least lower the vitality and render the body more vulnerable to disease." (Folwell on Sewerage.)

From both aesthetic and public health standpoints it is essential, therefore, that human wastes should be removed from the neighborhood in as quick and unexposed a manner as possible. The water carriage system to which we commonly apply the term "sewerage" meets both these requirements in a way so superior to other methods of collection that its adoption by a community is merely a question of having the public water supply necessary to its successful operation.

There are substitutes for the water carriage system. Of these the pail or earth-closet system is to be greatly preferred to the use of privies or cesspools provided the pails are removed regularly and thoroughly cleaned. In northern climates at least during the winter months it would seem better to use privies, providing the latter are thoroughly cleaned in the spring. The suggested use of privies in this case is owing to the practical impossibility of operating a pail system in an efficient manner during freezing weather. In all cases in which privies are used during the summer months care should be taken to exclude the flys by insisting that the receptacle in which the excreta are deposited be kept as dark as possible.

As has been said, at the best these dry sewerage methods are merely substitutes for the water carriage system, and in all cases of civic growth are finally replaced by it. In considering the problem peculiar to the water carriage system of sewerage its two-fold function must be remembered. In the first place it must collect and transport, quickly and without exposure, the wastes of the household to a place where a suitable disposal may be made, and in the second place it must collect and suitably dispose of the stormwater drainage. When the decision to install a sewerage system has been finally arrived at, there thus immediately arises the problem as to whether these two functions shall be performed by one system of sewers, or shall be cared for by a separate system for each. Many arguments have been offered, both for and against each system. In general it might be said that much smaller pipes are required to carry the sanitary sewage than are necessary for the transportation of storm water. It is also often feasible to allow the stormwater an outfall at points in the drainage channel at which it would not be advisable to deliver sanitary sewage. Also, although a duplication of the system is more or less necessary, it is not wholly so, since the stormwater may be allowed to run along the street gutters for at least the length of a block without serious inconvenience to pedestrians, and thus mains and submains only are necessary in the drainage system. Should the sewage have to be treated before final disposal the question is not open to argument: a separate system should be installed.

If the water carriage system be properly designed and operated the excreta and kitchen slops will be removed from the neighborhood of the householder before any objectionable gases have begun to form. If, however, due to the lack of either carrying velocity or transporting depth, a deposit forms in the sewer there arise conditions which, although not necessarily directly conducive to disease, nevertheless create a serious nuisance, and should not be tolerated. For a proper working of the system not only must there be an adequate fall between the beginning of the sewer and its point of outfall, but each separate foot of the sewer must have its proportionate share of such incline. In addition to this continuous grade, there must also be sufficient depth to the flowing sewage. It is sometimes impracticable to provide this latter condition, since the volume of sanitary sewage is not great in comparison to the minimum size of pipe required by other considerations. In the large sewers of a combined system also the dry-weather flow is small and thus in both systems flushing of the sewers, to remove deposits which may form, may be necessary. In the combined system this flushing is often satisfactorily performed by the storm water, but in separate systems and even in combined systems during dry weather conditions it is necessary to arrange for periodic artificial flushing of the sewers.

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[*] The 1st, 2nd, 3rd and 4th articles of this series were published in our issues of Feb. 17, Mar. 3, April [illegible] and April [illegible] respectively.

There are many points that may arise in design but these are not suitable for treatment in a series of articles such as the present. It might not be out of place, however, to discuss briefly the question of drainage involving the carrying capacity of given sizes of sewers. It seems to be a very prevalent idea that size merely enters into the question of capacity. It should be remembered, however, that the grade upon which the sewers are laid is equally important, so that in speaking of the capacity of a 14-inch sewer, for instance, the grade upon which it is to be laid must also be stated.

The ventilation of sewers and the danger to be apprehended from sewer gas is also a matter of public interest. It is also one upon which quite divergent views are held. These have almost a national flavor, in that most English engineers and writers on the subject emphasize the danger to be apprehended from the air in sewers, whilst European and American engineers hold to the opinion that at the worst the gases may have only a detrimental effect in lowering the vitality of anyone breathing them. It can quite truthfully be said that in a properly designed system the voyager in the large sewers of a city will not be subjected to as impure air as is to be found in many schools, churches or other places of public gathering. It would seem to the author that quantitative experiments have established the fact that sewer gas is not to be considered as one of the agents for the direct transference of disease.

The problems peculiar to sewerage, or rather, sewage collection, have their own interest, but the field for investigation at the present time is mainly the question of the disposal of the sewage once it is collected. It is proposed to treat this subject in the next article.

Shearing Strength of Joints Between Old and New Concrete

SOME recent investigations of the strength in shear of a horizontal construction joint between the stem and flange of reinforced-concrete T-beams were made by Prof. L. J. Johnson and Mr. John R. Nichols of the Civil Engineering faculty of Harvard University. These tests, made at the instance of a Boston contracting firm, were presented before a meeting of the American Society of Civil Engineers. Other tests, more simple of application but having the same object in view, were made at the same time and are reported in an article by Mr. Nichols in the April number of "Harvard Engineering Journal," from which the following brief report is taken.

The tests consisted (1) of pushing a conical plug large end first out of a surrounding ring or casing and (2) of crushing a prism with a sharply inclined joint, the plug having been cast a week later than the ring and the upper part of the prism formed of concrete some days older than the lower part.

For the first of these tests three concrete rings were cast 8 inches thick, each ring having a tapered hole 8 inches in diameter at the top and 8¼ inches at the bottom. The cores for the holes were of wood turned in a lathe and finished with shellac. Notwithstanding the smoothness of the cores, the concrete surface of the holes was somewhat rough, due to leanness of the concrete mixture and to abrasion occasioned by withdrawing the cores. The rings were reinforced with three steel hoops.

When the rings were a week old they were inverted and placed on 2-inch planks in which circular holes 7½ inches in diameter had been cut. The holes in the rings were made concentric with those in the planks. The planks rested on the floor. Concrete was then poured to within 2 inches of the top and was carefully tamped. Thus a plug 8 inches long was cast in each ring, projecting 2 inches at the smaller end and lacking 2 inches of filling the hole at the larger end.

The specimens thus prepared were placed at various ages in the testing machine in the position shown in the drawing and the plugs pushed out. The strength of the joint in bond shear is measured by the load required to start the plug. The numerical results of this test are presented in the following table:

No. of specimen	Age of ring, days	Age of plug, days	Total load, lb.	Unit bond shear, lb. per sq. in.
1	35	28	122,000	800
2	14	7	92,400	605
3	21	14	90,200	591

The unit shear is computed on the assumption that the intensity is uniform over the area of the plug in contact with the ring. The maximum intensity was certainly not less than the value thus obtained and was probably much greater. The load required to start the plug was the maximum reached; but the frictional resistance remained high after the plug started, falling off slowly as the motion proceeded.

Compression Prisms

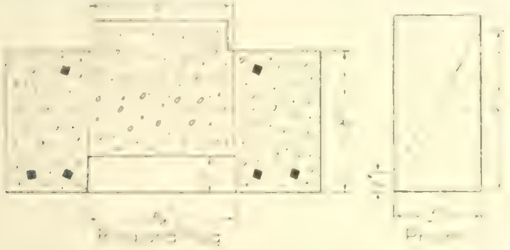
The other test was of two 5 x 5 x 10-in. compression prisms. The forms for the prisms were first tilted over to within about 30 degrees of the horizontal and filled half full, the top of the concrete remaining level. The top surface was fairly smooth.

Four days later the forms were righted and filled. The result was a prism with a diagonal joint. The surface of the old concrete was not scraped or otherwise treated in any way before placing the new.

The specimens were placed in the testing machine and a load applied longitudinally, as in a compression test. Both specimens broke at the joint suddenly with a report, one at a load of 26,200 lb., the other at 33,700 lb. The ultimate unit bond shear is computed to be 496 and 621 lb. per square inch respectively. The break on the joint was clean, no signs of abrasion appearing on the surfaces.

Conclusions

While these tests, in Mr. Nichol's opinion, are hardly numerous enough to warrant any sweeping conclusions, they at least tend to show that the shearing stress on a construction joint between sections of concrete cast at different times—the newer concrete cast in contact with the older—may easily reach 500 lb. per square inch without yielding, even when no reinforcement crosses the joint. How high a shear the joint can resist with reinforcement to hold the two parts together is yet to be determined by tests. It may reasonably be expected to reach a higher value than that attained in these tests, though even here the pieces of concrete connected by the joint were to some extent prevented from separating. In the case of the rings and plugs the shape of the specimens precluded any substantial tension on the joint, and with the prisms the component of the load normal to the joint induced compression. The value for the bond shear reached in these tests, however, is high enough to warrant the placing of a vertical-construction joint in the middle of spans where the unit shear would seldom exceed 25 lb. per square inch, and never 100 lb. per square inch, in a floor designed in accordance with present accepted practice.



Cross-section and side elevation of test pieces.

Sedimentation Test of Concrete Mixtures

A RECENT paper read before the British Institute in London, Eng., offers some simple, practical suggestions for determining the requirements of efficiency in both machine and hand mixing. They are based on the tendency of cement and aggregates to settle separately when agitated in water, and constitute what may be called a "sedimentation" test.

Sufficient attention, says the author, has not been given to the proper mixing of concrete. It is a process which has a perfectly definite point of completion, which is, however, not always attained. Concrete may be said to be thoroughly mixed when all the ingredients are as uniformly distributed as possible throughout the mass. If we accept this as a definition of proper mixing, then samples taken from different parts of a heap of concrete should contain the same proportions of stone, sand, and cement. The different rates of settlement of these three afford the engineer a simple method of measuring the relative proportions in any part of a heap of concrete.

If, for instance, a small quantity of concrete be placed in a tall glass vessel full of water, shaken up, and allowed to settle, three distinct layers of sediment are formed. The stones or gravel settle immediately; then follows the sand; and after a much longer period—about ten minutes in a vessel 12 in. high—the cement forms another well-defined layer. The depth of these layers varies as the amount of the respective materials present; hence a simple measurement of the depths in two samples enables us to compare the relative quantities of the different ingredients at any two parts of the heap.

In practice the application of this test may be simplified thus: Excluding the case of concrete which is semi-liquid, and in which the coarse matter may therefore have separated from the fine, we may safely assume that if the sand and cement are properly mixed the coarser parts will also be mixed, since the time required to mix uniformly increases as the grain becomes finer. I have therefore found it advisable to take account only of the distribution of the cement through the sand, as this permits the test to be made with much smaller samples of concrete than if the coarse aggregate were also included.

Inspection Alone Insufficient—There were two special tests made, to which attention should be drawn. The first was directed towards determining what was the true value of inspection alone as a test of concrete mixing. For this purpose a sample of mortar of the proportions cement 1, sand 2, was made; beside this was placed another having cement 1, sand 2½; but no difference could be detected by eye. The result was the same with cement 1, sand 3; and it was only with cement 1, sand 3½, that any difference in appearance could with certainty be detected. On applying the sedimentation test to these samples, the difference in strength between 1:2 and 2½ was easily observed. It is therefore quite clear that inspection alone—the test which is ordinarily applied—is not sufficient to determine whether concrete is properly mixed or not.

The second test was one of hand-mixed concrete turned twice dry, twice wet. Seven tests were made of different batches on a job of a reputable contractor in London; and uniformity was found in one only. The percentages of variation in the amount of cement found in different parts of each of the seven batches were: 0, 4, 7, 15, 15, 17, 24.

All batches, except that which showed the largest variation, 24 per cent., were mixed in my presence or that of the foreman or engineer; that particular batch was mixed by the men alone, without supervision. It would therefore seem that when concrete is mixed by hand it may not be of uniform strength; and that, to bring the weakest parts up to the strength required, an excess of concrete must be used, equal to at least 10 per cent. more than if uniformity of mixing be assured.

I am aware, however, that mixing machines vary greatly in their ability to mix, and also require supervision in their working, as well as does hand mixing. I have found the test described very useful in determining for any particular mixer the time or number of revolutions required to give a uniform concrete. It enables the engineer to say when mixing is complete with any particular aggregate or proportions, and thus to avoid either improperly mixed concrete or the unnecessary curtailment of the output of a machine due to over-mixing.

Unit Structural Concrete

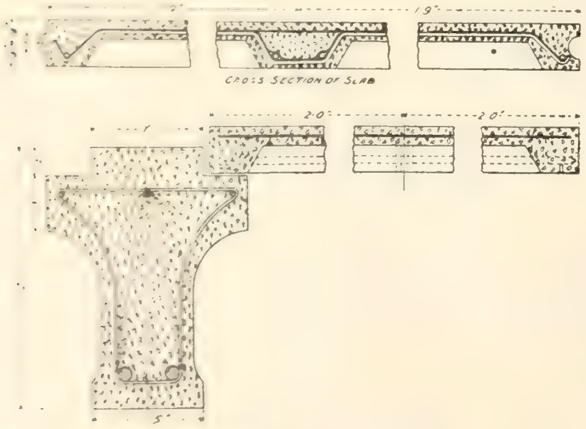
The Extent of Present Development in Building Construction

PROBABLY the majority of failures in concrete structures may be traced directly to inferior concrete. The problem before the structural engineer is to obtain a material of proper quality and strict adherence to design under the present field methods of construction, since, unlike all other structural materials, the members are moulded in place and cannot be tested or inspected until they become an integral part ot the building, after which correction of defects is practically impossible.

With the constantly increasing price of lumber; the unsatisfactory results obtained by standard steel forms for monolithic construction, and the testimony of many of the largest contractors to the effect that the cost of temporary forms for structural concrete now averages from one-third to one-half of the total cost of the structure, it is evident that there is an opportunity for large economy in form expense.

These are the two main factors leading to the development of the unit system of concrete construction. In this system the members are moulded separately, at permanent or temporary factories, where practices can be standardized, conditions created to insure uniformly high-grade concrete and a reduction in form expense since forms may be removed earlier than in monolithic construction, and, therefore, fewer forms will be required.

Many make the mistake of assuming that the so-called "monolithic" concrete structure is really monolithic. Those familiar with the actual practice in pouring concrete in such a building know how impossible it is to deposit concrete continuously so that all parts of the building, or even one floor, will have the successive batches of concrete deposited before the preceding bath takes its initial set. The result is always a building of comparatively large monolithic units, the joints coming at such places as field conditions allow. By unit methods such joints always come at predetermined points.



Unit Structural Concrete. Fig. 1

The basis of theory of design for concrete and steel is the bond between concrete and steel, therefore, to construct a building of previously moulded units it is only necessary to work out the details of connection to insure a proper bond of the steel, to obtain equally strong and rigid structures as can be built by the so-called "monolithic" system. As a matter of fact, the continuous casting of large volumes of concrete where heavy and light sections, such as girders, columns, and slabs, are made monolithic, has led to some of the greatest difficulties in concrete construction, the worst of which has been the proper provision for reinforcement to prevent cracks by differential temperature expansion, and shrinkage of concrete during set.

By the separately moulded method the shrinkage takes place before the member is in position, and the best of opportunity for properly taking care of temperature stresses and expansion is afforded by the large number of joints between the field and previously moulded concrete, among which the total movement is so distributed as to make the movement at any single point imperceptible.

In addition to the advantages as regards theory of design above mentioned, the separately moulded system has proven advantageous in that the members can be finished within a few hours after being cast. This subject of finish of concrete is one that is becoming of more and more importance. On the so-called "monolithic" structure where the forms must be left on for weeks after the members are cast, it is extremely difficult to finish the surface except by the expensive process of cutting or the unsatisfactory method of plastering.

Unit Structural Concrete. Fig. 2

The first development in separately moulded concrete units was in the form of floor sections to take the place of ordinary monolithic concrete or terra cotta between steel beams. These floors have been on the market for some time.

It has been proved conclusively by the result of tests made on these factory floor sections that the usual working stresses which are used for the design of structures where field concrete is to be used should not be made the legal requirements for design when factory made concrete is to be used. Where concrete is made in the factory under conditions which insure a uniform product that, at the age the member is to be used, will have an average compressive strength of at least five thousand pounds per square inch, and that is subject to regulation by actual physical test of the members before use, a working stress of five hundred or even seven hundred and fifty pounds per square inch is obviously absurd.

As shown in Figure 1, the design of the floor consists of floor beams with intermediate slabs, the floor beams being made in a combination of metal and sand moulds, the particular value of which for producing strong dense concrete has long been well known by the profession, and the slabs being made by the vibratory process of packing, a method by no means new, but productive of remarkable results as regards strength and density. The reinforcement of these slabs is quickly designed to permit of very quick assembling and the prevention of any movement of the steel in the forms.

Figure 2 shows a factory floor having a clear span of 19 feet, designed for a live load of 150 pounds. This floor has sustained a test load of six hundred pounds per square foot with no appreciable deflection, and has an actual dead weight of only forty pounds per square foot.

Development in unit methods has been limited almost exclusively to floor members on account of lack of equipment for handling larger units. There has, however, been a general development of unit methods in field construction for all, or practically all, the members of a building to be manufactured at or near the site and erected much like structural steel or mill construction. While the conditions under which these structures are built of field made units are not such as to produce the results obtained in factories, it is only a matter of volume of demand before permanent factories will be established, making this possible.

The largest demonstration as regards amount of work executed and perfection of details in the unit method of construction has been made by the Unit Construction Company of St. Louis, Mo., who have been actively engaged in this form of construction for the past five years, during which time they have built many structures.

This company, which controls practically all the patents issued on unit concrete construction, employs the unit system on nearly all of the members of the building, including walls, columns, and even skylights. Buildings as high as six storeys have been successfully constructed and a complete demonstration made of the practicability of the system to high, as well as low, structures except, perhaps, for a slight difference in cost of equipment for erection.

Methods in Painting Concrete Surfaces

By L. P. Nemezek

THERE are two reasons for treating concrete surfaces, namely, to preserve the structure against forces which exert deteriorating influences, and to improve the appearance or lend beauty thereto. Unfortunately, in obtaining the desired decoration, frequently at the lowest possible cost, the proper methods of application are sadly neglected. Furthermore, it is within the past ten years only that the matter of treating concrete surfaces has been forcibly brought to the attention of the master painter, thereby opening up a field which presents innumerable opportunities with regard to the application of satisfactory coatings.

To combine protective and decorative qualities it is necessary to have in mind not only those things which will lend beauty, but how they must be applied in order to promote the life of concrete, at the same time insuring maximum service of the coating. It is advisable to study the properties of the constituents of cement and concrete in order to determine how they affect the stability of the structure, and also how they affect the coating applied over them.

Concrete surfaces may be divided into three general classes. First, interior walls of plaster (sand or smooth finish) and cement; second, cement and concrete floors; third, stucco, cement and exterior concrete surfaces. The conditions to be considered are very much the same in each of these surfaces, and the treatment given should be practically the same. It would not be practicable to prescribe a set formula to apply to all cement and concrete surfaces. While they are very similar, it is necessary for the painter to use his judgment and experience, making such slight modifications as each particular case requires. The age of the wall, its environment and the character of the finish are factors which will modify the treatment necessary in order to obtain the best results.

For the reason that lime has a saponifying action on oils, and furthermore, recognizing the fact that all cements and concrete construction contains alkali in varying amounts, the first matter to consider is how to treat the surfaces in order either to eliminate this material by neutralizing it or in some manner to keep it from exerting its harmful influence on the vehicle portion of the paint which is to be applied. A treatment which has for its object the elimination of whatever free alkali is present on and near the surface in many instances proves injurious to the structure. The presence of mineral acids while neutralizing the lime, will detract, we believe, from the life of concrete construction. Solutions of materials that change the lime to insoluble salts, which do not act on oils, have been suggested from time to time and have been used with varying success. What is known as the Macnichol zinc sulphate treatment has proven very successful for the treatment of interior walls before applying prepared flat wall-finishes, or other coatings. It is very generally recommended, and its satisfactory character is based on the reaction which changes the free lime to the sulphate form, the latter posessing no saponifying action on the paint which is subsequently applied. This treatment has given excellent results on walls which are free from permeation. On walls, however, through which moisture from some source or other forces its way, the soluble salts present throughout are dissolved and are brought to the surface, where they give rise to such undesirable conditions as staining, etc., and upon the evaporation of the moisture, efflorescence develops.

Before applying the solution of zinc sulphate, it is desirable to go carefully over the walls, removing all dirt, grease and loosely adhering particles of concrete, at the same time filling up any broken parts of the surface and cracks. The surface should then be allowed to stand for at least 48 hours, in order to allow it to dry out properly, and in order to obtain full benefit of the neutralizing properties of the solution. The use of water-solutions is undesirable unless the surface has ample time to dry out. The excess zinc sulphate should be brushed off before applying the paint.

Wherever possible, the surface to be coated should be allowed to stand from three to five weeks in order to give it time to dry out. The undesirable effects obtained by the presence of alkali in the concrete are also lessened when the surface is allowed to stand for some time.

Considerable attention has been given to the painting of cement and concrete floors, as there are many reasons why such coatings are highly desirable and in many cases, absolutely necessary. The absorption of grease and oil tends to disfigure a floor, and some of the best authorities on concrete construction are of the opinion that a considerable number of these materials have a disintegrating action. Many mineral oils, when allowed to penetrate into concrete that is not thoroughly dry, promote disintegration. Oil surfaces [illegible] show any noticeable indication of deterioration, however.

The floor is made sanitary by painting, because it can be kept clean and free from dust and dirt. All opportunity for "powdering" is overcome by the thin film of paint which, when properly applied, has a firm hold within the mass of concrete, and besides eliminating the possibility of surface wear, makes an impervious coating which prevents the absorption of moisture. This coat will withstand the action of forces which would readily disintegrate the untreated concrete. Oils and grease are kept from penetrating into the concrete. With reference to the finish, outside of natural wood stains the same color properties and decoration can be obtained on concrete floors that are possible by the painting of wood.

In applying the paint two factors must be given careful attention. While the pigment is a requisite of considerable importance, the vehicle will, in almost every instance, determine the wearing properties. Floors are subject to hard usage, and must stand severe strains. It is necessary, therefore, to use a material which will oxidize to a dry film and which will retain sufficient elasticity to withstand the strains to which it is exposed. Ordinary floor paints which prove satisfactory when used over wood give like results when used over a properly applied filler. The wear closely resembles that found on a wooden floor. The paint coat invariably possesses better bond within the concrete and the service in many cases is superior to that obtained from the same paint applied on wood.

Natural wear will gradually make necessary the repainting of floors. It is not necessary to apply a filler again. One coat of paint, well brushed out, gives the best results. In preparing the surface for repainting, no strong alkali should be used for cleaning, as it will not only act upon the paint, but, if not thoroughly removed, will also affect the following coat. It is advisable to go over the surface with warm water and soap and allow sufficient time to elapse for drying.

Paints made especially for cement and concrete surfaces show improved wearing properties when applied over a filler. This was found in a test comprising all of the leading brands on the market. Considering that it is chiefly the vehicle of a paint which is acted upon by free alkali present in concrete, and with the knowledge that up to the present time all those vehicles which give good results are saponifiable, it is easily explained why paint applied over a surface which has been treated to correct for the alkali will give better results than if certain portions of a paint, no matter how scientifically constructed, must neutralize the objectionable forces at work, when as a natural consequence in so doing the bond within the structure is weakened or broken in places.

Artificial Coloring of Clay

By J. Keele and W. S. Bishop

THE common brick clay used in the greater part of Southwestern Ontario is a stratified surface clay. The upper one to three feet of this clay burns to a red color; the lower portions burn buff. The brickmaker calls it "gray" or "white." The bottom clay burns to a buff color for the reason that it contains a far higher percentage of lime than it does of iron. The excess of lime exercises a bleaching action on the iron during the burning process, so that it prevents the latter from giving the red coloration, which the burned product would otherwise have. The greater part of the lime has been leached from the upper portion of the clay by weathering action, so that there is a larger percentage of iron than lime in the weathered clay and it produces a red brick.

This thin layer of weathered clay has been exhausted at several brick plants, and some manufacturers who have run out of the red burning clay are looking for some substance, which, when mixed with their buff burning clay, will produce a red brick.

The following tests were undertaken to find out if it were possible to accomplish this result by using small quantities of certain materials which contain large percentages of iron oxide and which are easily obtained in quantity. The materials of this character used in the experiments are sold under the trade names of Venetian red, maroon oxide and crocus martis. The Venetian red and maroon oxide are the common reddish-brown colors, so largely used in house painting. The crocus martis is used principally by potters and enameled brick manufacturers. It is the ingredient which is mixed with glazes or enamels to produce brown and yellow colors. It is also used extensively as a metal polish. Manufacturers of sand lime and cement brick sometimes use maroon oxide to give a reddish color to their wares. As brick of this class are not burned, the red stain added to them in the mixing machine remains intact.

The clay sample was taken from James Lochrie's brickyard on Weston Road near Toronto. Its chemical analysis is as follows:

Silica	47.20 per cent.	Lime	17.30 per cent
Alumina	14.04 per cent.	Magnesia	3.10 per cent
Iron oxide	3.25 per cent.		

The analysis is fairly representative for the buff burning surface clays in Ontario. Analysis made to determine the iron and lime contents in the coloring material gave the following percentages:

	Iron Oxide	Lime		Iron Oxide	Lime
Venetian red	50.2	12.4	Crocus martis	89.0	1.7
Maroon oxide	60.7	6.0			

The Venetian red can be had for $1 per 100 lbs. and the maroon oxide for $1.50 per 100, when bought in large quantities. The crocus martis is quoted in an English catalog at $2.50 per cwt. It requires about three tons of clay to make 1,000 brick, so that the cost per 1,000 of adding 4 per cent. of maroon oxide, or 2 per cent. of crocus martis would amount to about $3.60.

Make Good Coloring Agents

When the quantity of lime in a clay is three times that of the iron oxide, a buff or cream color results in the burned product. Referring to the analysis of the clay from Lochrie's yard, there is about 7.5 per cent. of lime in excess of the amount which would mask the color produced by the iron. The coloring materials all contain more or less impurities; but, the richer they are in iron oxide, the more expensive they are, and the better coloring agents. For example, if 4 per cent. of Venetian red was taken, we should not get 4 per cent. of iron oxide, but only about 2 per cent. If 4 per cent. of crocus martis was used we should get an equivalent of about 3½ per cent. of iron oxide.

Without going any further into the subject, it can readily be seen that the production of a red color in a high-lime, buff-burning clay by means of iron oxide is not a commercial proposition.

For the burning tests, small brick of clay containing 2, 3 and 4 per cent. of Venetian red and maroon oxide were made up as well as some containing 1 and 2 per cent. of crocus martis. Brick were also made which contained none of the coloring ingredient and burned with the others for the purpose of comparison. The test pieces were burned in a muffle kiln, fired with oil, the maximum temperature reached being 2,000° F.

On drawing these samples, after the kiln was cooled down, it was found that the color of the burned clay had not changed. In fact, the brick which contained the coloring matter could not be distinguished from those which had none, except that there was a slight pink bloom on one side of the brick containing 4 per cent. of maroon oxide.

The red color of the added iron oxide was all absorbed by the lime in the clay and it was evident from the results that much larger quantities of the iron oxides would have to be used in order to produce anything like a saleable red color.

Corrosion Due to Paints

As the result of experiments by two German chemists, it appears that the corrosion of iron and steel may be directly due to the paints applied for the very purpose of protecting the metal.

For the purpose of an investigation into the general subject of corrosion, these chemists had prepared some steel plates which were painted after the surface had been polished, and then numbers were written on them with paint of another colour for identification.

It was found on subsequent examination that corrosion took place chiefly, if not entirely, under the painted numbers, where the metal was presumably best protected against exterior influences.

In consequence of this discovery, various painted iron signs were examined with the result that the rust on the metal was invariably more evident under the lettering than elsewhere, and with a few exceptions was entirely confined to such areas.

Having thus received a clear hint to the effect that paint might encourage corrosion under certain conditions, the investigators decided to make experiments with paints, including the following pigments:—White-lead, zinc oxide, red-lead, iron oxide, white-lead with lampblack, and zinc oxide with lampblack.

Four polished steel plates were coated with these paints, the plates receiving one, two, three, and four layers, respectively. After drying, the painted plates were exposed to steam at atmospheric pressure for twenty-four hours, and then the paint was removed.

It was found that the metal had not rusted at all under the single coats of paint, that it was slightly rusted under two coats, more so under three coats, and badly rusted under four coats.

These results are particularly surprising, the explanation given being that the medium in the second coat softens and renders the first coat of paint porous, and that successive applications have a similar effect, the porosity of the paint being in direct proportion to the number of coats.

If this theory is correct, one thick coat of paint should be more efficient than several thin coats on metal and all other surfaces to be protected from corrosive or destructive influences. Further investigation into this subject would be decidedly interesting.

Freezing Process in Building Construction

Although frequently employed in mining and civil engineering work, the freezing process is somewhat a novelty in connection with excavations for the foundations of buildings. The process has recently been applied with economy in Berlin, where the foundations of a large building had to be carried to the depth of 10 ft. below the foundations of the premises on either side. As the latter were founded on running sand it was out of the question to excavate without special precautions, and the freezing process was adopted as an alternative to the pneumatic caisson method.

Freezing pipes of 5-in. diameter were sunk around the pit to be excavated and connected by headers with a brine pump and tanks, the cold brine being pumped through 1-in. pipes enclosed in the 5-in. pipes, and returning to the tanks through the latter. When the apparatus was put into operation the effect was to establish a perfectly stable barrier of frozen quicksand, permitting the pit to be excavated by ordinary means without difficulty or risk.

At a recent meeting of the Concrete Institute (London, Eng.) a paper was read by Mr. H. C. Johnson, showing the wide range of strength indicated by a series of tests of cement in the form of paste, mortar and concrete. The results of the tests are put forward with the object of directing further attention to the importance of testing all materials entering into structural works. From the detailed results of his experiments the author draws the following among other conclusions:—(1) That the strength of cement paste is not a reliable index to the strength of concrete; (2) that the best way of ascertaining the suitability of cement for reinforced concrete is to test it in the form of mortar (a) hardened in water, (b) hardened in air, rejecting any cement if the strength of test (b) is greater than that for test (a); (3) that not less than 22 per cent. of water should be allowed in gauging paste, and not less than 3 per cent., plus one-fourth the percentage in the paste in gauging mortar; (4) that the standard of values for cement to be used in reinforced concrete work should be raised by 25 per cent., with the object of justifying higher working stresses on concrete.

Novel Application of Reinforced Concrete

A novel application of ferro-concrete has recently been made at a manufacturing establishment in Glasgow by the construction of cylindrical chambers for the reception and treatment of chemicals which have an injurious effect on iron and steel. The cylinders are 10 ft. in diameter, closed at one end, and as shown in our illustration they are set in brickwork after the fashion of steam boilers. The top of the setting is finished with a ferro-concrete platform on which is fixed the machinery for dealing with the material. The latter is both wet and hot when first placed inside the cylinders through openings in the top, and remains in the cylinders until it solidifies. After this has taken place a revolving drum with knives is passed into the cylinder and worked through the material until the latter is converted into powder, which is then conveyed to the top of the building. The cylinder walls are 6 in. thick, the reinforcement consisting of two series of bars, placed 8 in. apart, both longitudinally and circumferentially. The platform above the settling is reinforced in the customary manner.

Manganese steel is to be used in the manufacture of six new dredge buckets for service on the Panama Canal. The rock encountered at the Pacific entrance has worn away rapidly the lips of the carbon steel buckets now in use. These buckets will supersede an equal number of buckets of the old style and on the result of the test will depend their rejection or selection for future use.

The Canadian Pacific Railway Shops at Ogden, near Calgary

THE Canadian Pacific Railway has recently put in operation near Calgary, a large shop plant of more than ordinary interest by reason of its size, its complete and modern character and the speed with which it was created. The work was designed and built in its entirety by Westinghouse, Church, Kerr & Company, consulting and constructing engineers, of Montreal and New York, working under the direction of Mr. J. G. Sullivan, chief engineer of the Western Lines of the Canadian Pacific Railway, and Mr. N. E. Brooks, Divisional Engineer.

The shop location is at Ogden (named in honor of a vice-president of the railway) and is 4½ miles from Calgary and about 2,250 miles from Montreal. Its distance from those sections of the country, where the greater part of the construction materials, machinery and equipment were produced, constituted the first and one of the most important problems. A second important problem arose on account of the construction season being extremely short, owing to the high latitude, frost remaining in the ground until about April 1st and returning with snow as early as October 1st. A third very important problem was the comparative scarcity of labor in the Canadian Northwest, this condition being greatly aggravated during the late summer months, when harvesting begins and all labor markets are practically drained of men.

Plans had, therefore, to be drawn, materials ordered, deliveries made and complete field organization perfected in order that the shops could be closed in between April 1st and December 1st, and sufficiently heated to enable inside work to be continued after cold weather had set in.

The shops consist in general of main locomotive shop (including erecting, machine, blacksmith and boiler shops), tender and wheel shop, pattern shop and pattern storage, foundry, storehouse and office building, material platforms and scrap docks, oil house, carriage repair and paint shop, freight car repair shop, planing mill, boiler house, 12-60 ft. yard cranes, and miscellaneous structures, including transfer table and pit for coach shop, main hoist, wells and water tower, and all service systems, such as drainage, sewage, fire-protection, water supply, etc.

Main Locomotive Shop

This building is designed to contain the erecting shop, machine shop, blacksmith shop and boiler shop. The erecting shop is of a transverse lift-over type and contains thirty-five bays, each twenty-five feet between centers, and is 778 feet long by 75 feet wide. The entire area is served by two electric traveling cranes, carried on two levels. The 120-ton crane, furnished with two 50-ton trolleys, is carried on the upper level and is used for transfering, wheeling and unwheeling locomotives and handling parts. One of the trolleys on this crane is equipped with a ten-ton auxiliary hoist for handling light material at a high hoisting speed. Another ten-ton traveling electric crane operates at high speed and serves the entire area of the erecting shop, for handling material in that shop and transferring same to the blacksmith shop and machine shop. The machine shop and the boiler shop are located in adjacent bays on either side of the erecting shop.

Provision is made on the crane columns in the erecting shop for attaching portable jib cranes for use in dismantling and erecting material on the front ends of locomotives. These cranes are placed where desired by means of the overhead traveling electric cranes. Entrance for locomotives to the erecting shop is provided through four doors, located in the west side of the shop, two of these doors being located at either end. For providing additional means for entrance of locomotives, six door openings are provided in the east wall of the machine shop, two of these being at the north end and four at the south end. All of these entrance tracks are connected up with the erecting pits of the several stalls where they enter the building, to permit of the locomotives moving into and out of the shop through these entrances should this movement become desirable or necessary.

The machine shop to contain heavy machine tools is located parallel with and adjoining the erecting shop on one side and is 60 ft. 9 in. wide and the same length as the erecting shop. A high speed traveling crane of ten-ton capacity covers the entire area of this shop, material can be brought into the shop through a door provided in the end of the building, the material being brought up to the end of the machine shop by the travelling electric yard crane which travels across the end and outside of the locomotive shop.

Space for the lighter machine tools is provided in a shop, 60 ft. 9 in. wide parallel with and alongside of the heavy machine shop and of the same length as that shop. An overhead trolley beam is provided on the bottom chord of the roof truss to permit of using a traveling electric trolley for handling material longitudinally in this shop. Provision has been made for a foreman's office elevated above the floor and having liberal glass surface in the walls so as to give the best possible view of the shop.

The blacksmith shop is located alongside of and parallel with the erecting shop on the opposite side from the machine shop. This building consists of two bays each 332 ft. long, 60 ft. 9 in. and 50 ft. wide respectively. Space is provided for heavy forging work, steam hammers, etc., in the building immediately adjoining the erecting shop. The blacksmith shop will not be served by a travelling crane but provision has been made for jib cranes to handle the material from steam hammers, forgings, etc. In a building of lower cross-section alongside are located the furnaces, bolt headers and other blacksmith shop machinery. This portion of the shop is served by a trolley its full length to facilitate the longitudinal movement of material through the shop.

The space for the boiler shop is provided in a two-bay building, alongside of and parallel with the erecting shop at the end of the blacksmith shop, 352 ft. long and the same width as the latter shop. That part of the boiler shop immediately adjoining the erecting shop is provided with a 40-ton travelling electric crane equipped with two 20-ton trolleys serving the entire area of the boiler shop, for handling the boilers and other material. The riveting tower is located between two of the roof trusses in the end of the boiler shop, with a 25-ton crane for serving the hydraulic riveter. In the outer of the two bays of the boiler shop, space is provided for a flue shop and boiler shop tools. The entire length of this space is served by a 3-ton overhead travelling trolley for handling material through the shop. Space for a fine rattler is provided immediately outside of and adjacent to the low bay of the boiler shop. An entrance track is provided through the outside wall of the boiler shop on which boilers or other equipment going to this department can be delivered on cars under the travelling crane, for unloading, or may be loaded out for shipment in the same way. This facilitates the handling of boilers from steam shovels, pile drivers, Lidgerwoods, etc. Jib cranes are provided for serving the individual machines in the boiler shop where such service may be necessary.

The heating throughout is done by indirect fan system. For distributing the heated air, underground concrete and tile ducts are used. The general illumination consists of Cooper-Hewitt lamps with circuit and plug boxes for extension loop cords. Provision has also been made for incandescent lighting circuits for individual lighting at machine tools where required, and for outlet boxes for connecting extension lamp cords to provide lighting for the interior of the locomotive boilers on the erecting floor. Toilets, lavatories, and metal lockers are provided in the various departments of this shop. A suitable system of piping is provided for distributing live steam, compressed air, fuel oil and water for fire protection, drinking and hydraulic pressure. Outlets for compressed air are provided in duplicate in the sides of each of the engine pits to supply compressed air for operating pneumatic tools.

In the main locomotive shop the electrical feeders from the power company's transmission lines are carried in underground ducts, bringing the current at the voltage delivered by the power company, namely, 2,200 volts, to a sub-station located adjacent to and immediately outside of the low machine bay, the transformers for stepping down to 440 volts being located in this sub-station. In this sub-station two motor generator sets for supplying direct current are also located. The switchboard is also located in this sub-station for controlling the power and lighting circuits in the machine shop and for the tender shop and foundry. As far as possible distributing feeders are carried in conduit beneath the shop floor, thereby minimizing the amount of exposed wiring in the shops. The building containing all of the above departments of the locomotive shop is constructed with structural steel frame carried on concrete foundations. The exterior walls up to the window sill line are of concrete, above the window sills of hollow-tile plaster. Ample window area is provided in the side walls and in roof monitors and skylights so as to give sufficient natural lighting. Good ventilation is obtained through ventilators in the monitors and skylights and by the use of swinging sash in the vertical walls.

With the exception of the blacksmith shop and a portion of the boiler shop the floor throughout is constructed with a 1½ asphalt mastic wearing surface, which is underlaid with a rough concrete slab about six inches thick. In the blacksmith shop and a portion of the boiler shop the floor is of cinders. The roof sheathing is constructed of 2 x 4's, surfaced on one side and one edge and spiked together on edge, thus affording good fire resistance qualities and materially reducing the heat losses. The roof water-proofing is four-ply tarred felt, pitch and gravel, with copper flashing. Suitable drain leaders are provided and connected into underground tiled drains to carry off the water from the roof. The large skylight on the erecting shop bay is of lead covered bars with ribbed wired glass.

C.P.R. Shops, Ogden. Alta. Main building from west, showing blacksmith and boiler shop bays.

Tender and Wheel Shop

This building is constructed with structural steel frame and with steel roof trusses, otherwise the general construction of the building is similar to that described for the main locomotive shop. It is an L-shaped structure 263 ft. x 80 ft. wide with L 180 ft. long by 80 ft. wide, and affords space for making repairs to locomotive tenders, steam shovels and other maintenance of way equipment. That portion of the shop intended to receive the equipment to be repaired is spanned over its entire area by a 20-ton high speed travelling electric crane equipped with two ten-ton trolleys. Longitudinal tracks on 20-foot centres extend to the doors in the building wall. A car puller is installed for moving the equipment into and out of the shop. A sufficient number of tracks extend through the rear wall of the building to facilitate the movement of material into the shop.

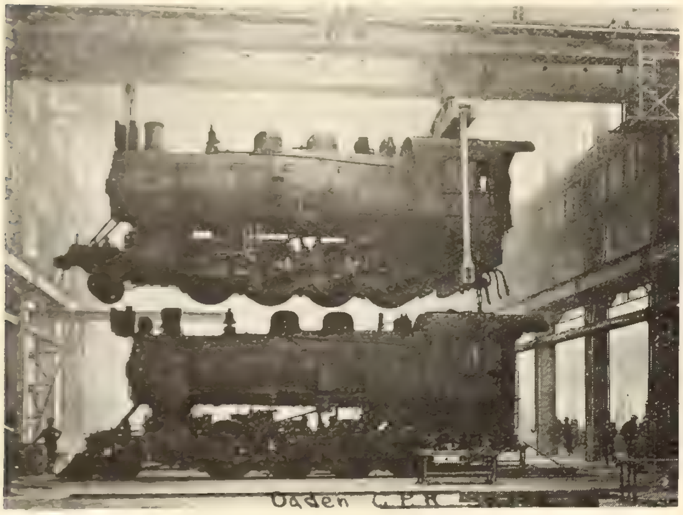
In the L portion, of the building, of lower cross-section space is provided for steel tire wheel lathes, wheel and axle machinery and such other tools as are required. A depressed track carried along the ends of the wheel storage tracks outside facilitates unloading and loading of wheels and axles. The heating, lighting, and service equipment is similar to that described to the main locomotive

Pattern Shop and Pattern Storage

Space for the pattern shop and pattern storage is provided. In a separate building located adjacent to the foundry, a fire wall separating the pattern shop from the pattern storage. The general construction of the building is the same as that of the other buildings the roof of slow burning mill construction. The structure is 162 ft. long by 31 ft. wide, is heated by the direct system, and lighted with keyless socket marine type incandescent lamps. A sprinkler system is provided for fire protection.

Foundry

The grey iron foundry building is 203 ft. long by 80 ft. wide, constructed with two bays. The frame is of structural steel carried on concrete footings. The general construction is the same as that described for the other buildings except that the floor is of the usual clay type used in foundries and the roof over the cupola room is of corrugated asbestos. The bay of higher cross-section is served over its entire length by a ten-ton high speed electric travelling crane. Jib cranes, attached to building columns are provided. These cranes are so arranged that they may be removed from one location to another if desired, being handled by the electric travelling crane. In the side bay of lower cross-section space is provided for core making and shop moulding floor. The charging floor for the cupola is located in the centre of the lower bay.



C.P.R. Shops, Ogden, Alta. Interior of Locomotive Shop, showing 120-ton crane.

Heating is by the indirect fan system with underground tile and concrete hot-air ducts. For general illumination flaming arcs are used in the high bay and ordinary arcs in the low bay, with outlet boxes for extension lamp cords. Toilets, lavatories, and conveniences for the men are provided; also steam, air,. and water service, for fire protection and drinking purposes.

The location of this building alongside of and parallel with the electric travelling yard crane enables the unloading of scrap and pig-iron to be taken care of by the yard crane. This close proximity of the foundry to the yard crane also remains to a minimum the handling of the castings from the foundry to storage, to the main shop, or in loading for shipment.

Storehouse and Office Building

This building is 252 ft. 6 in. long by 60 ft. wide. One end of the building for a length of forty feet is carried up three storeys and contains offices on the second and third floors and a fire-proof vault. The remainder of the building, for store-house purposes, is two storeys high and contains electric elevator, platform scales, material bins, and shelving. The walls are constructed of hollow-tile blocks on concrete foundations. The framing is of heavy timbers, with roof sheathing of two by fours surfaced on one side and one edge, and spiked together on edge. The foundations are carried up to bring the floor of the storeroom to car door height.

The necessary toilet and lavatory facilities are provided. The offices are heated by direct radiation, the remainder of the building being heated by the indirect system. The lighting is by incandescent lamps. Fire protection is by automatic sprinklers. The ground floor of the storehouse has a 1½ in. asphalt mastic wearing surface. The other floors throughout the building are of wood. The window arrangement is such as to best accommodate the material bins and shelves without interference with good lighting.

The storehouse is located parallel with the main locomotive shop. The space between these two buildings is spanned by a high speed travelling crane, which can be utilized to handle all heavy material to and from the storage space that is provided between the storehouse and the erecting shop. The use of this crane practically eliminates manual handling of heavy material and permits of handling numerous small parts in quantities when contained in suitable receptacles.

Material Platforms and Scrap Dock

A material platform 90 ft. wide and about 350 ft. long, abuts one end of the storehouse. This platform is also carried along either side of the storehouse where it is fifteen feet wide. It is constructed of concrete retaining walls filled in with earth and a top-dressing of cinders covers the fill except alongside of storehouse where plank covering is laid. The platform extends to and along the sides of the oil houes.

Oil House

For storing and distributing oil a separate building is provided convenient to, but located far enough away from, the storehouse and other buildings to eliminate the fire risk. It is constructed with tile walls (plastered on the exterior) on concrete foundations, with a concrete basement at one end for the tanks which contain the oil, for local distribution. The roof is of reinforced concrete slab, as is also the floor of the pump room over the basement. That part of the building used for storing oil in barrels has a cinder floor. The pump room is partitioned off with a brick wall carried up to make a fire wall.

Ten oil tanks with measuring pumps are installed, and provision is made for conveniently emptying the oil from barrels into the tanks in the basement. The oil house basement is heated by the direct system to the high temperature necessary to render the oil fluid during extreme cold weather; the direct system being also used to heat the rest of the building. The lighting of the building is with keyless socket marine type incandescent lamps. Fire protection including sprinklers, is installed.

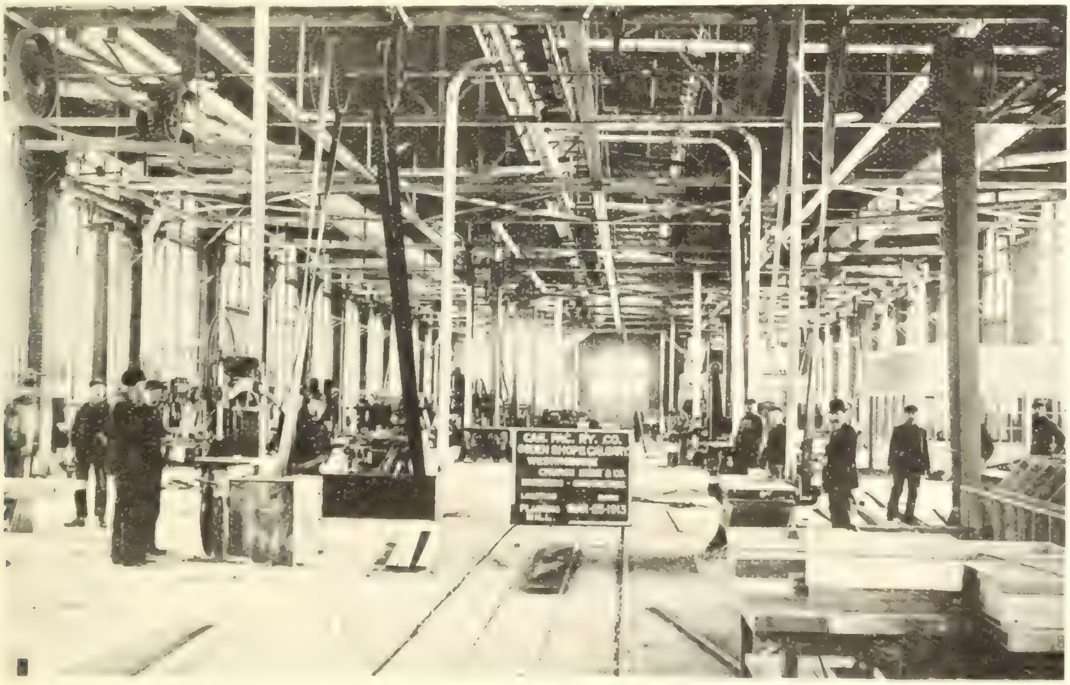
Coach Repair and Paint Shop

The building containing these departments is 362 ft. long by 146 ft. wide, having fifteen tracks on 24 ft. centres. It is constructed with hollow building tile carried on concrete foundation. Heavy timber posts support the roof which is of slow burning mill construction. Otherwise, the construction is the same as that described for the main shop building. Space is provided along one side of the building for varnish room, upholstering, office, sub-store, paint storage, heating plant and air brake repairs. When necessity arises for increased shop capacity in this department it is proposed to obtain such increase by the erection of another shop on the opposite side of the transfer table.

Heating is by the indirect fan system with underground concrete and tile ducts. Lighting is by incandescent lamps. Compressed air, steam and water service, including fire protection and automatic sprinklers, are provided. Toilets, lavatories, and conveniences for the men are also supplied in this shop.

Freight Car Repair Shop

This building is 231 ft. wide by 303 ft. long and contains eight repair tracks, spaced in pairs, with industrial track between each pair of repair tracks. A tile wall partitions off the shop, fifty feet wide along one side, which will contain the blacksmith forges, tools, heating plant, foreman's office, toilets and lavatories. The building is of structural steel frame with tile walls, plastered on the outside, with saw-tooth roof construction. The general construction of the building otherwise is the same as that of the other shop buildings. An overhead trolley beam is provided to permit of handling timbers with a trolley into the shop.



C.P.R. Shops, Ogden, Alta. Interior of planing mill.

Compressed air, steam and water service piping, and fire protection, including automatic sprinklers, are supplied. Heating is with the indirect fan system with underground concrete and tile ducts. Lighting is by 100-watt tungsten lamps. The location of this building alongside of the lumber yard permits of handling lumber, so that it can be passed through into the shop without rehandling.

Planing Mill

This building is 303 ft. long by 80 ft. wide and contains the wood-working machinery. The frame is of structural steel carried on concrete footings. The general construction of the building is the same as that of the other shop buildings. A track extends through the building longitudinally to permit of movement of material in at one end to the various machines and out through the opposite with the minimum amount of handling. The building is located so as to be convenient to the passenger car shop and the freight car shop. The lumber yard is located back of and at one end of the planing mill.

Suitable piping has been provided for distributing compressed air and water. The fire protection system includes automatic sprinklers. Provision is made for toilets, lavatories, and metal lockers for the men employed in this department. Heating is by the indirect fan system with galvanized iron heating ducts. Lighting is by mercury vapor lamps.

Boiler House

This building contains sufficient space for 2,100 horse-power water tube boilers that are required to provide steam for heating the shops and for other purposes for which steam is required throughout the shops. The building is constructed with brick walls carried on concrete foundations with steel roof trusses and supports for coal bunkers. The chimney is of reinforced concrete, 200 feet high with a minimum diameter of nine feet.

The overhead coal bunker for each boiler is divided by a reinforced concrete partition into two compartments, to provide for storing and burning two kinds of coal. An overhead storage bin for ashes is provided from which bin the cinders can be discharged by gravity into cars alongside of the building. A concrete dumping hopper is provided outside for dumping coal from cars. A pivot steel elevator raises and discharges the coal into the overhead bunker. A skip-bucket, with electric hoist handles the ashes into the ash bin.

The boiler units are 350 horse-power rating and are set in three batteries of two each. Five of the boilers are equipped with chain grate stokers. The sixth boiler has the shaking grates to burn shavings and other planing mill refuse. Space is also provided for three electrically driven air compressors each of a capacity of 1,500 cubic feet of free air per minute. Only two of these compressors are installed at this time. Transformers and distributing panel are located in this building for transforming and distributing light and power current to the shop, yard, freight car shop, planing mill, and coach repair shop. There is no direct current apparatus in this station. Provision has been made for two incoming 2200 volt lines, one of 2,000 kw. and the second of 1,000 kw. capacity for breakdown service.

The steam required for the steam hammers and other shop purposes during the summer time can be supplied by one boiler. The boiler capacity provided will afford one spare boiler during the extreme weather conditions when the maximum steam demand occurs.

A yard crane runway, 1,260 feet long, extends from the west line of the locomotive shop and carries a 10-ton high speed electric travelling crane with eighty-foot span, serving the material yard and a portion of the storehouse platform and scrap dock. One of the storehouse tracks extends through under this crane, resulting in giving ample space for the storage of material alongside of the storehouse, foundry and locomotive shop. By this arrangement heavy material can be unloaded, stored, and rehandled to the shop or loaded out again by the crane for shipment, practically eliminating manual labor in the handling of all heavy material.

The transfer table for serving the coach shop is 75 feet long, of 150 tons capacity, equipped with electric motor, with concrete transfer table pit 400 feet long, extending out far enough at either end of the building, for providing entrance and egress at both ends.

C.P.R. Shops, Ogden, Alta. Coach Repair Shop.

The mess building is 269 ft. 6 in. long by 31 ft. 10 in. wide, of wooden frame construction, covered outside with sheathing, building paper and siding and sealed on the inside with metal sheathing. It has a concrete floor and contains a dining room and lunch room for the workmen and a dining room for the officials together with kitchen and pantry. Sixty feet of the length of the building is carried up two storeys to provide an apprentice schoolroom and quarters for the help. Heating is by the direct system and lighting with incandescent lamps.

There are also two small buildings located near the freight repair tracks for blacksmith shops and workmen's tools, and in one of them is a small toilet and office. Dry kiln material bins, plate and iron racks, coal and coke sheds, are also provided.

For obtaining water for shop purposes there have been put down two eight-inch wells equipped with electrically operated pumps. To supplement this supply and to provide a main source of supply for fire protection the City of Calgary has brought down into the shop site to a point midway the length of the main shop building on the west side a ten-inch cast iron water main. The shop service and fire lines are connected on to this main and into a steel tank of 125,000 gallons capacity, which is erected on a 70-ft. steel tower, principally for use in connection with automatic sprinklers in the various buildings where these are installed. A complete fire protection system has been put in with hydrants distributed about the shop yard.

The sewage system in the shop yard may be divided into the sanitary and storm sewers. The City of Calgary is furnishing the main sanitary sewer, beginning at the east line of the freight car shop and extending to the eastern boundary of the shop property. All the sanitary sewage lines from the various buildings are connected into this sewer. Storm sewers are provided where necessary to carry off the roof water from the buildings where the roof construction is such that this cannot be discharged onto the ground.

The location of the shops is about four and one-half miles east of Calgary, practically on the open prairie and on the beginning of construction arrangements had to be made to house and board on the shop property a considerable quantity of labor. To this end, frame bunk houses were built with two tiers of bunks on each side of the building, eight bunks long, each house having a capacity of 32 men. Stoves were placed in the centre aisle and benches along the sides of the lower tier of bunks. On the coming of summer and as the labor forces were increased some of the men were housed in standard 12 x 14 wall tents which accommodated four men each. A large mess room and kitchen and storeroom space was also fitted up with a capacity of feeding about 400 men at one time. Great care was exercised throughout the work in keeping the camp in a sanitary condition. This work was largely under the direction of doctors who visited the camp each day to take care of all sickness and an arrangement was also made whereby those who were employed in the work voluntarily contributed a small amount from their wages for the services of these doctors. This amount also included hospital service when necessary. Due to this care there was very little sickness on the job.

As there were no accommodations for men with families near the shops the Railroad Company put into temporary service a train to carry the men back and forth from Calgary and several men went back and forth on this train each day. This arrangement helped the situation considerably, especially as the season advanced and all kinds of skilled and unskilled labor became more difficult to obtain. A standing order was placed through several labor agencies in Calgary to send men daily to the job. As the work neared completion the bunk houses and mess house previously mentioned were turned over to the Railroad to take care of their own men who were at that time living in cars on the property. This, of course, released the cars and permitted their use at other points. It should be again pointed out that it was not possible to break ground until April 1st, 1912, and by March 17th, 1913, the locomotive shop was in full operation. When the magnitude of the work is considered as also its distance from the larger centres, it will be appreciated that a record for prompt performance has been established.

Levis Dry Dock

THE Government are asking for tenders for the proposed dry dock at Levis, P.Q., designed by by Mr. E. Lafleur. The dock will be situated at Lauzon, two miles east of Levis, and near the present dock. The plans show that the length from the caisson stop to the head wall will be 1,150 feet, the width of the entrance 120 feet, and the depth of sill on ordinary high water spring tides 40 feet. The dock will be divided into two parts, 650 and 500 feet respectively. The outer entrance will be closed by a steel rolling caisson and the ship or floating caisson will close another entrance. The ship caisson will also fit the outer face of the outer sill, so as to facilitate repairs to the rolling caisson when required. The dock will be emptied by three centrifugal pumps each having a capacity of 60,000 gallons per minute, the pumps being run by electric motors. The current for these will be furnished by generators revolved by three steam turbines, steam to be furnished by eight water tube boilers capable of supplying 3,600 horse power; the rolling caisson will be moved by an electric motor.

The dock walls, floor, the portal walls of the outer and inner caissons, culverts, pump wells, sumps, and superstructures of the wharf and bulkheads will be built with concrete.

Wrought Iron v. Mild Steel

By Robert G. Clark, A.M. Inst. C.E., in Ferro-Concrete

For some time past engineers have been rather uneasy owing to the rapid deterioration of naked mild steel when used for constructional work, and the continual painting and general upkeep charges have led them back to install wrought iron instead. This is very noticeable in the case of bridges exposed to salt water, and of railway over-bridges that have to withstand the sulphurous fumes emitted from locomotives.

Unfortunately, wrought iron is rather more expensive per ton, and its strength is about 15 per cent. less than that of mild steel, so that in adopting wrought iron at present prices the engineer has to face an extra expenditure of at least 20 per cent.

Experiments are now being carried out in the United States to see if wrought iron can be produced at about the price of mild steel, and at the Reading works there is every prospect of this being an accomplished fact within the next year.

It may be of interest to state that one authority on steel and iron manufacture considers that the reason why wrought iron stands the weather better than steel is that it is made in a plastic state, whereas steel is made in a fluid state. In steel-making it is possible to get rid of all the slag, but in the case of wrought iron all the rolling and squeezing in the world will not eliminate the slag. Therefore, nearly all the particles of the wrought iron are covered by a thin coating of slag which acts to a certain limited extent as a protective agent.

Even if wrought iron were obtainable in the future at the same price as structural steel, the additional cost entailed by its relatively low tensile and compressive strength, and the certainty that corrosion must occur in all naked iron structures, despite the most careful painting, are very powerful arguments in favour of ferro-concrete, as concrete has been abundantly proved to be the only reliable protective coating available for the permanent preservation of iron and steel.

In the face of these considerations it is clear that there will be plenty of room for the adoption of ferro-concrete, even if steel should be replaced by a more durable material for structural work.

Interesting Roofing Tests

A series of tests conducted by the British Fire Prevention Committee on asbestos cement corrugated roofing are of considerable interest, and demonstrate the need for further research in the direction of improving roof coverings of the class examined as well as customary methods of support. Of the experimental roofs tested, four were covered with the asbestos material laid on boarding, in two others the covering was carried on purlins, and in two more the ends of the covering sheets were bedded on the walls. Roofs Nos. 1 to 4 (32 deg. pitch) were tested by placing a fire of limited area on top and allowing it to burn for periods of 30 to 45 minutes with water test in two instances. In every case the covering developed cracks of more or less serious character, and the boarding was readily ignited. Roofs No. 5 and 6 (45 deg. pitch) were tested by fire in close proximity to the covering for 60 minutes, water being applied to No. 5 roof after the fire test. The results were that one of the sheets in this roof was broken away along the lower edge and to some extent brittle, and that two holes were formed in one sheet of No. 6 roof, where also one of the purlins was considerably charred. Roofs No. 7 and 8 (68 deg. pitch) were tested similarly to the two previously mentioned roofs with generally similar results.

A new bridge over the Stour, between Sudbury and Ballingdon, Eng., has recently been opened. The structure, which is 150 ft. long and 36 ft. wide between parapets, is built in five spans entirely of ferro-concrete. The spans are supported between the abutments by four rows, each containing four ferro-concrete piles, 16 in. square by 17 ft. to 30 ft. in length. Three steam rollers, weighing approximately 35 tons, were used in the tests, which resulted in a maximum deflection of a trifle over 1-16 in. The work cost $9,000.

Architectural treatment of a brick chimney for a power house in Montreal consists of a buff brick for the body of the chimney, with a panel course of gray terra cotta blocks spanned by arches of the same material. This course is about 20 feet below a projecting course of terra cotta near the top. The panels and arches project about 4 inches from the face of the chimney and are backed by common brick with circular reinforcing bands of iron, ¼ x 2 in. in size, laid between the two courses at regular intervals. The total height of the structure from the top of the foundation is 211 feet with an external diameter at the bottom of 17 feet decreasing uniformly to 9 ft. at the top.

Fundamental Points in Concrete Road Construction

By W. A. McIntyre

ROADS require close supervision over every detail of construction in order that their life may justify the money put into them. There are many little points essential to the success of Portland cement concrete roads, and these are so often overlooked that a mention of them at this time is advisable. My remarks are confined to country roads where there are no curbs and gutters, but the construction of city streets is practically the same.

A foundation, dry and firm, with a covering which will not allow water to pass through it, is the chief characteristic of a road of the best type.

If the subsoil is of a character to retain water, it is very important that such a system of under-drainage be installed as will carry the underground water from beneath the road. In the dry summer weather this work may not appear necessary, but information should always be obtained regarding the action of the subsoil during the wet season and when frost is coming out of the ground.

There are, of course, many soils of a gravelly, sandy, or other character which are self-draining and do not require particular attention, but it is a fact that the defects in most of our country highways which are built upon clay soils or those which do not drain themselves, are to be attributed to a lack of drainage. There are two general methods in use to dispose of the water. One is to lay a 3 or 4-inch land tile under the shoulder and about 12 inches outside the edge of the concrete. The ends of the tile should be placed close together and clean stone of at least 1½-inch size put on the sides and top of the tile to a depth of 3 or more inches. If there is any danger of dirt reaching and getting through the joints, the upper half of the tile at the joints should be covered with paper before the stone is put upon it.

The other method is to lay a French drain in the same position. With this type of drain the best results are obtained by placing in the bottom flat stones of 6, 8 and 10-inch dimensions. These should be laid in the form of a culvert and should be covered to a depth of about 6 inches with smaller stone of not less than 1½-inch size. The width of the ditch should be about 12 inches. In both cases the depth of the bottom depends upon the character of the subsoil, but should in no case be less than 18 inches below the finished grade of the road at the crown.

If the soil is such that water passes very slowly through it, lateral drains of the same type leading into the side drain will be necessary about 50 feet apart, and possibly another longitudinal drain on the opposite side will be advisable.

When the back fill is thrown over the drain, it should be thoroughly puddled and compacted with hand rammers so as to prevent any settlement. With the water out of the way, the subbase should be compacted until there is no creeping in front of the roller. The usual custom is to use a 10-ton roller, run over the base once or twice, and call the job done irrespective of the condition. Such a method compacts only a thin crust on the surface, and this is all destroyed before the concrete is placed. Better results can be obtained by using a lighter roller, say of 5 tons. This will necessitate running over the road many times; consequently greater care will be exercised and a stronger subbase result.

Even Sub-Grade Important

The evenness of the sub-grade is of great importance. The shape may be flat or curved, but there must be no bumps or depressions. The concrete must have every opportunity of easy movement in order to adjust itself to temperature and moisture changes. Should there be irregularities in the sub-grade the free movement is restricted—the friction on the base is increased—and since the tensile strength of concrete is quite low, cracks will form in irregular lines. When a mixer is used, it should be run on planks in order that the sub-grade will be kept in good condition. If the concrete road is being laid over an old macadam or bituminous road, and if the base of the same is intact, it is often inadvisable to remove it unless the old grade cannot be raised. All the bumps should, however, be removed and all holes filled in with stone and thoroughly rolled. This brings up rather a serious question. Concrete needs but a light transverse grade to shed water. Other types of country road have a heavy crown. Therefore if concrete is laid on top of an old road, it will be necessary to have the required thickness, say 6 inches, at the crown, and let the thickness of the sides come what they will or to bring the sides up to grade with stone thoroughly rolled. In the first case the concrete will have the thinnest section along the normally weakest line. In the second case, unless the new stone is screened and made temporarily impervious, otherwise a macadam road built, there will be so much water and cement lost between the stones that the concrete at the sides will be considerably weakened.

At all times the sub-base must be thoroughly wet before any concrete is placed upon it. Particular attention must be paid to this during the dry summer months. This work does not keep a man busy all the time and on that account is often neglected, but some one should always be delegated to perform it. If it is not done, water will be absorbed by the base and there will not be the required quantity in the concrete to allow of a uniform set and to give uniform strength, and pit holes and cracks are likely to appear.

Effective Work with Template

In the building of a country road there are so many uses for side forms that they are almost indispensable. Roads have been built by digging out of the earth a trench of sufficient depth for the concrete. It is then necessary to level off the surface by means of shovel, with an uneven contour and ragged edges resulting. By the use of side forms securely staked to line and grade, the most important finishing tool is made available—the template. It is from a 2 by 8-inch plank, cut to the proper shape of the road, and preferably with the striking edge steel bound. The concrete may be placed into position on the road either by shovel, wheelbarrow, or bucket, according to the method of mixing, and leveled off to the approximate grade by shovels. After a few feet have been laid the template is used to strike off the crown. In order to make the template more effective in its work and to get a more uniform mix, it is advisable that the concrete be sloppy wet. The objection to it is that water runs away to the sides and down grade. Care in making tight side forms will retain it. The objection is more than overweighed because no tamping is required and hence no walking upon the concrete, and many stones not covered in the mixer will be coated, due to the carrying capacity of the excess waer. If the concrete is too dry the template is hard to move and has to be used repeatedly to give a good surface. The template should have two handles on each end so as to make easier its operation. A man at each end works it back and forth at the same time moves it slightly forward. This side motion requires that the template be about two feet longer than the width of the road. When there is an excess of material, it is necesary to use the template as a scraper—getting the approximate shape—and go over this section again with the back-and-forth motion. By the use of a sloppy wet mixture the template worked in this manner gives the concrete sufficient tamping and brings to the top sufficient mortar to produce an even surface. If, however, the stone used in the concrete is too large—over 1¼ inches—the template will drag the large pieces along and leave holes behind the template.

In moving the template forward some of the larger stones are pulled from the surface and collect in front of the template, making the operation hard to perform, exposing a lot of uncoated stone, and causing water carrying cement to run off the sides. The stones should be scraped forward by a man with a shovel and deposited in the bottom of the concrete layer. In running the template over a surface a second time rich mortar collects as did the stone the first time, and has a tendency to run off at the sides. This should be scraped forward the same as the stone.

Care should be taken in moving the template forward that it is not lifted from the side forms and moved two or three inches at a time. Such an operation will leave the surface full of little undulations and make the road noisy and uncomfortable for travel.

After the template has been used the surface of the concrete is left quite wet and in a condition which will not give good results if troweled at once.

Sufficient time should elapse in order that the excess moisture will be absorbed or evaporated and then the surface should be troweled with a wooden float wherever necessary. The time between using the template and floating depends upon the condition of the weather, but is usually about thirty or forty minutes. Care should be taken not to overtrowel and thus bring to the surface too much fine stuff.

Troweling and Brooming

Troweling should be done from a bridge spanning the road and resting upon the side forms. Then there is no danger of the wet concrete being disturbed by placing planks upon it or by the finishers trying to take in too large an area without moving and stepping upon the surface. Such a bridge is cheap and has the added advantage of allowing the workmen a short cut from one side of the road to the other.

A better finish is given to the road if the surface is broomed after floating. A stable broom is used for this purpose, and works to the best advantage about two hours after the surface is floated. If the road is not too wide, the brooming can be done from each side, care being take to place the broom lightly at each stroke, otherwise the bridge should be employed for this purpose. The last two hours' work each day is too wet to broom and part of it not ready to trowel at quitting time. This will have to be done, when the concrete is in proper condition, by the night watchman on the job.

Brooming produces sufficient surface roughness to give good foothold for horses, and yet remains smooth enough to keep tractive resistance at a minimum.

When the concrete has hardened sufficiently to stand without breaking down or running, usually about two hours after laying, the side forms should be removed and the edges beveled. That is, the abrupt edge should be cut off with a shovel or may be hammered down by the back of the shovel. A direct blow should not be struck, but the shovel should be pulled toward the user as the downward stroke is made. This will prevent the breaking down of the concrete beneath and will have a tendency to plaster the edge. An angle of 45 degrees is about right for the bevel, and at least a 3-inch corner should be cut off. The last 30 feet each day will have to be done by the watchman.

To be safe in case of a sudden rain, a hot sun, or high wind, at least 100 feet of canvas should be on the work. When used, it should not be allowed to touch the concrete. Canvas is also of advantage after brooming, when the sun is very hot or the wind high.

When the concrete is sufficiently hard to resist pitting of the surface, it should be sprinkled with water. This cannot usually be done until the day followed the laying. On this date the surface should be covered with about 2 inches of dirt or sand which must be kept continually wet for one week. In most constructions a 2-inch pipe line will have to be laid and water for the concrete pumped. A T-valve will have to be placed about every 200 feet, and these can be used to connect the hose used for sprinkling.

Covering and Wetting

The covering and wetting is one of the essentials for successful construction. If it is not done, and the tendency is to neglect it, the concrete will not have sufficient strength to withstand the stresses brought about by contracting while hardening and cracks will appear. These may not be harmful, but they are unsightly and may cause the road to be unjustly condemned.

This leads to the spacing of the joints along which cracks shall appear. The proper size blocks between joints is practically an indeterminate proposition. It depends upon the character of the sub-base, the smoothness of the sub-base, the proportions used in the concrete, the mixing of the concrete, the amount of water used, the character of the aggregates, the climatic conditions, and so forth. There is undoubtedly an economical distance to use and this will have to be determined from an investigation of what has happened in roads already constructed. Arbitrary distances have been assumed, making blocks from 5 feet to 100 feet long. In the most successful construction 25-foot blocks have been used. I believe, however, that with the proper amount of care in workmanship this length can be increased and perhaps doubled.

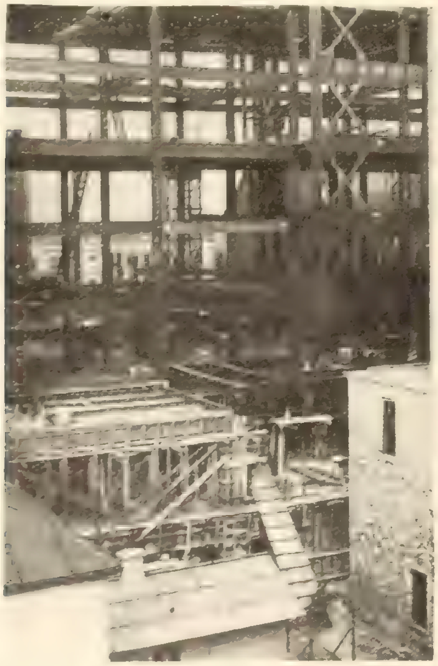
When the last laid concrete is at least ten days old, the dirt may be removed and the road thrown open to travel.

As with all improved types of pavements, it is important that good shoulders be built. The width of road usually constructed, while sufficient to care for ordinary traffic, is "crowded" when large or fast moving vehicles pass one another, and more so at night time, when every driver is blinded by automobile lights and has to give wide berth to passing vehicles. A shoulder from two to four feet wide should be built of such material as will stand a little travel. It must be hard enough to prevent wheels from sinking in and permit them to get back upon the concrete without undue strain upon the wheels. They should be built of stone or gravel, thoroughly compacted by ramming, and should be given a slope toward the ditch of 1½ inches to the foot. If the width of the road will permit, the stone shoulder may be extended by compacting the earth as far as the ditch. The ditch should be of ample capacity, and of sufficient grade quickly to carry off all the surface water to the nearest water course. With proper care the success of the concrete road is assured. Many failures will, however, be encountered before road-builders are thoroughly acquainted with the seriousness of the work, but it is the failures that show wherein error lies, and the perfect road evolved.

According to a United States contemporary, the steel smoke stack of the electric light plant at Canton, Pa., 100 ft. high, recently needed painting. The fireman made a sort of kite or parachute which snugly fitted inside the stack. He attached a string to the parachute, the draught in the stack carried it and the string with it up through the stack and out, the parachute coming down outside the stack. A small rope was next tied to the string and pulled up, and finally a rope strong enought to hold a man. Then tackle was arranged to haul up a man to do the painting.

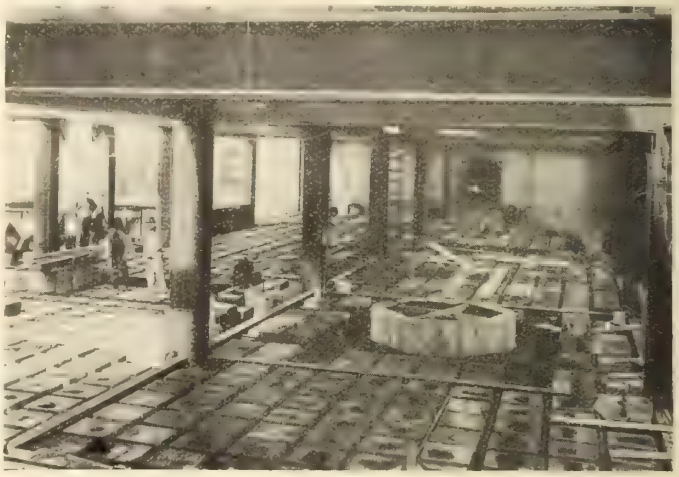
The C. P. R. Hotel, Vancouver

Construction work is advancing steadily on the new central portion of the Hotel Vancouver, which is being erected by Messrs. Skene & Christie for the C. P. R. at the corner of Granville and Georgia streets, Vancouver. The ultimate cost of the hotel proper has been estimated at fully $2,500,000, but only about one-half of the structure is included in the present contract, that portion under construction extending from the rear of the new Orpheum Theatre through to Georgia street, consisting of the central cross wing, and two wings toward Howe street. When completed the central portion of the hotel will be fifteen storeys in height, with ten bedroom storeys in the wings. It is intended to demolish the old structures facing on Granville street and extend the new building over the entire ground area as soon as the present building is far enough advanced to permit of its being utilized for hotel purposes.



Progress of construction on central wing.

The building will consist of a steel frame with reinforced concrete floors on the Kahn two-way system of combination floor dome and concrete construction, as furnished by the Trussed Concrete Steel Company of Canada. The floor domes each measuring 20 inches square on the top, and 21 inches square at the base, are made of pressed steel. The reinforcing steel is placed in each direction between the rows of domes. Hy-rib lath is used for the ceiling. The framework supporting the floors is structural steel, the columns being arranged in panels of approximately 21 ft. x 24 ft. centers and the system of floor construction takes care of the loads without the use of any intermediate supporting beams.



Typical floor, showing Kahn two-way system adopted.

The exterior facing of the building is to be of Clayburn buff brick, with terra cotta and marble trimmings. The interior will be chiefly finished in fine wood panelling walnut and oak. The part now under construction will contain about 300 bedrooms, and when the hotel is completed, there will be provided more than 500 bedrooms.

This large structure has been carefully planned with regard to interior arrangement. Only the best materials are being used in the construction and when completed it will undoubtedly rank as one of the best equipped hotels on the North American continent.

The Use of Marble in Lighting

It is reported that patents recently have been taken out in Germany for using marble instead of glass in lamps, which medium has the effect of making the illumination scarcely distinguished from daylight.

A number of experiments have been made with tinted and patterned types of glass with the idea of producing this effect. Marble was planed down until it is difficult to realize that it is artificially lighted.—tensities of light were shown from behind. The result was exactly what so many hundreds of experiments had failed to produce. Developing this discovery, the inventors fitted lights to the cornice of a room so that it was somewhat transparent.

Elimination of Taste in Water Treated with Calcium Hypochlorite*

By Arthur Lederer † and Frank Bachmann ‡

It is surprising that the problem of removing the taste from waters treated with chlorinated lime has received such scant attention in this country. More water-supplies are treated with chlorinated lime in the United States than in any other country of the world, yet while we frequently hear complaints about the taste of treated waters, which very often are justified, we have heard practically nothing about the remedies. We even know of cases where high concentrations of chlorinated lime accompanied by a taste have been accepted as an unavoidable evil, which could not be remedied except by decreasing the efficiency of the disinfection process.

The first experiments on the removal of taste due to chlorinated lime were made almost 20 years ago by Traube, who also was the first one to recommend chlorinated lime for the disinfection of water-supplies, although its germicidal action was known before. Traube applied 4.26 mg. of chlorinated lime containing 1.06 mg. of available chlorine to 1 liter of water and added after two hours contact 2.09 mg. of sodium sulphite. He claimed that an excess of sulphite up to 50 per cent. over the required quantity does no harm for the reason that the salt is quickly oxidized in the water to sodium sulphate, which cannot be tasted in such low concentrations. For 1,000,000 gal. of water Traube recommended 35.7 lb. of chlorinated line and 16.8 lb. of sodium sulphite. The quantity of chlorinated lime applied may seem abnormally high in the light of more recent observations and experiences in this country, but it explains why the early observers were forced to look for means to remove the repugnant aftertaste in waters thus overdosed.

Interesting Observations

The need for remedial measures grew still more pronounced when later observers like Bassenge, Sickenberger and Kaufmann, and Lode were led by laboratory tests to employ still larger quantities of chlorine in the form of chlorinated lime or sodium hypochlorite. Sickenberger and Kaufmann disinfected the turbid Nile water at Cairo with sodium hypochlorite equivalent to 2 mg. of available chlorine per liter, which corresponds to about 50 lb. of chlorinated lime per million gallons of water.

Bassenge recommended for disinfection on a large scale the enormous quantities of 2,445 lb. of chlorinated lime for a ten-minute contact period down to 270 lb. of chlorinated lime for two hours contact. To eliminate the taste a quantity of calcium bisulphite somewhat higher than the quantity of chlorinated lime employed had to be added. Bassenge decided on the use of calcium bisulphite for the neutralization of the excess-chlorine with the advice of Dr. Proskauer. Calcium bisulphite is a saturated solution of calcium sulphite in sulphurous acid. It has the strong odor of that acid. On standing it decomposes, forming calcium sulphite and water. The reason Bassenge did not make use of sodium sulphite, as did Traube, was that it forms sodium sulphate in sufficiently large quantities to have a marked therapeutic effect which would not be the case with calcium bisulphite. An additional reason was that the free acid present would more readily combine with the chlorine than would the neutral sulphite. No definite quantity of bisulphite was recommended since it rapidly changes on storage. The quantity had to be determined each time by actual trial. Lode likewise used excessive quantities of chlorinated lime and advised the use of either sodium or calcium sulphite for the neutralization of the chlorine after 5 to 10 min. contact. In a later publication he goes quite thoroughly into the question of removing the taste by various chemicals, of which he prefers the neutral sodium sulphite but still recommends for disinfection quantities of chlorinated lime as high as 1,250 lb. per million gallons of water.

It is also interesting to note, in connection with the early disinfection experiments, that acids were brought into contact with the water after the chlorinated lime has been added in order to liberate the active chlorine which otherwise would not enter into the reaction. Lode adds for each pound of chlorinated lime about 1.2 lb. of concentrated hydrochloric acid. Citric acid likewise has been used in quantities of approximately 15 grains per gallon of chlorinated water for the same purpose. It is said that the taste was not influenced by the addition of the citric acid.

From the foregoing it must be apparent that even if the taste was effectively removed by the addition of various chemicals, the treatment of water-supplies at that time must have proved too expensive to be considered anything more than a temporary relief measure in times of epidemics. As such the Traube-Lode process was employed during a typhoid epidemic at Pola (Austria) in the fall of 1896 and the winter of 1896-97 by Dr. Meerans on the recommendation of v. Kusy. A total of 45,000 gal. of treated water was supplied during that period and sodium thiosulphate served for the elimination of the taste. The consumers became eventually used to the water in spite of its high turbidity resulting from the chlorinated lime treatment. Lode criticized the use of sodium hyposulphite in Pola and assumed that it had been used by mistake since in his earlier writings, he called the sodium sulphite "antichlor" which as a matter of fact is the trade name for sodium thiosulphate. The uncertainty of the quantity of chlorinated lime to be added to different waters and the almost general introduction of safer ground-water supplies led the Germans to abandon altogether this treatment as a permanent procedure.

There are, however, industrial regions in Germany where similar conditions exist in regard to water-supplies as in this country, which have caused renewed interest in the hypochlorite treatment. Such conditions are met with in the coal mining region of the Ruhr watershed and disinfection of more than a dozen water-works supplies carried on by H. Bruns with quantities somewhat smaller than those originally employed by Traube gave, with two exceptions, very satisfactory results. The quantities of chlorinated lime varied between 12.5 to 25 lb. (containing approximately 33 per cent. of available chlorine) per 1,000,000 gal. While complaints were frequent when the treated water was used by the consumers, the complaints ceased as soon as sodium thiosulphate was added as a routine measure. The compound was added 15 to 30 min. after disinfection in quantities equivalent to 50 to 70 per cent. of the weight of the chlorinated lime. As stated above, the disinfection was a failure in two cases. In one case the organic contents of the water expressed as "oxygen consumed" reached as high as [illegible]

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* Abstract of a paper read at the annual meeting of the Illinois Water Supply Association.

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(parts per million) and in the other case the water contained 2 p.p.m. of iron.

The good results obtained on adding taste-removing chemicals induced us to believe that like results could be obtained in our "hypo" plants where the amount of chlorinated lime approaches the limit of recognizable taste. In some of our former observations* we found that 0.6 p.p.m. of available chlorine (equivalent to 15 lb. of chlorinated lime per 1,000,000 gal.) was about the smallest quantity which could be readily tasted, but it is a fact that even smaller quantities are discerned by sensitive non-smoking consumers, particularly when the temperature of the water is high. We should remember that in plants where smaller quantities, such as 6 to 8 lb. per 1,000,000 gal., are employed, accidental overdosing followed by a flood of complaints is frequent.

Reports from U.S. and Canadian Cities

W. H. Dittoe and R. F. MacDowell in reporting on the result of an inquiry among a large number of cities in United States and Canada, in which "hypo" treatment is installed, state that a taste is not often noticed when chlorinated lime is applied in quantities of 7 lb. per 1,000,000 gal. or less, but that there is often complaint on using larger quantities. With certain waters even smaller quantities may produce tastes and odors, however. It would then seem an advantage to apply a remedy if this can be done without materially influencing the cost of the treatment.

Our tests have been made on Lake Michigan water and while the relation of the chlorine to the chemicals applied theoretically remains the same, it is possible that the actual quantities would require adjustment with different water-supplies.

We know that storage of chlorinated waters by itself is a simple method by which to rid the water of the taste depending on the time allowed for this purpose. The chlorine taste in lake water treated with 12.5 lb. per 1,000,000 gal. disappeared, at room temperature, in a little over 3 hr. Simple aeration will hasten the disappearance, reducing the time to something like 2 hr. with the same quantity of bleach. The amount of air applied was 0.3 cu. ft. per gal. of water. It may also be stated here that the elimination of the taste coincides well with the disappearance of the potassium iodide-starch reaction. There is no definite chemical reaction taking place on aeration which would account for the speedier elimination of the taste; the chlorine seems to be carried off by the air bubbles passing through the liquid. On a large scale a prolonged storage period or storage with additional aeration would be in most cases not a practicable procedure. Contact of chlorinated water with wood charcoal will quickly do away with the chlorine taste, but the water in our experiments absorbed certain ingredients from the charcoal which by themselves resulted in a pronounced taste. Whether other carbonaceous material will give like results we do not know, but it is certain that sedimentation of filtration would be subsequently required to rid the water of the matter in suspension.

The chemicals which seemed of value for the purpose of removing the chlorine taste from waters are sodium sulphite and sodium thiosulphate, both of which are strong reducing agents and form tasteless compounds when brought into contact with chlorine. The calcium sulphite and calcium bisulphite which have been employed by some early observers have not been utilized by us for the reason that they are not readily obtainable and too expensive for practical application even when bought in bulk.

Our experiments on the neutralization with sodium sulphite were made on lake water treated with chlorinated lime as well as free freshly generated chlorine and practical tests coincided well with the theoretical quantities of chemical as determined by calculation. For 0.01569 gm. of bleach containing approximately 33 per cent. of available chlorine 0.01815 gm. of crystalline sodium sulphite were required, or 1.2 lb. of sulphite for each pound of chlorinated lime. One pound of liquid 100 per cent. chlorine would necessitate the addition of approximately 3.6 lb. of crystalline sodium sulphite for neutralization. An important point to keep in mind is that it takes as much sulphite for the free chlorine as for the total available chlorine in chlorinated lime to remove the taste of treated waters. The reaction between the sulphite and the chlorine takes place instantaneously, thus removing the taste as well as the odor at the same time. No harm can be done with a reasonable overdose since the sulphite could not be detected in such low concentrations. Furthermore it would take but a very short time for the dissolved oxygen in the water to convert the sulphites into sulphates.

Medicinally the sulphites are of low toxicity and fairly strong antiseptics on account of their ability to withdraw oxygen from organic matter but they are rarely used nowadays for that purpose. The average medicinal dose is 15 grains. Supposing we overdose a treated water containing 10 lb. of chlorinated lime per 1,000,000 gal. with 50 per cent. of the quantity of sulphite required, which would be an excess of 6 lb., one would have to drink about 370 gal. of the water to get a single medicinal dose, not considering any oxidation into sulphates at all. Since the medicinal dose of the sodium sulphate, which is formed in the reaction, is 240 grains its therapeutic effect is surely negligible.

The wholesale price of crystalline sodium sulphite is approximately 4c per lb. in 100 lb. lots. This would add about 125 per cent. to the cost of the chlorinated lime, assuming that the market price of lime (containing 33 per cent. of available chlorine) is 2⅛c per lb. Considering the benefit to be derived in many cases from the use of the sulphite the additional cost would not seem unreasonable. There are, however, serious drawbacks to the continued use of sodium sulphite, one of which is the fact that it deteriorates readily, forming sulphates which of course are completely inert as far as the taste-removing property is concerned. Weak solutions in particular will change from day to day.

The sodium thiosulphate as first applied in Pola and recently recommended by Bruns has striking advantages over the sodium sulphite. It is commercially used very extensively as "antichlor." When sodium sulphite comes into contact with chlorine the reaction taking place is the same as with iodines. With thiosulphate the oxidation is more complete and this therefore alters materially the proportions of chlorinated lime and thiosulphate necessary to do away with the taste and odor. The acids formed in the neutralization process immediately combine with bases to form neutral salts.

Lode stated that in his experiments he found it impossible to establish quantitively corresponding values of chlorine and thiosulphate and he recommended 0.8 to 0.9 of the quantity of the chlorinated lime for the purpose of taste removal. Bruns recommends values of 50 to 70 per cent. of the quantity of chlorinated lime applied. As a matter of fact it seemed impossible in our experiments to obtain checks when a chlorinated lime solution was titrated with a thiosulphate solution under addition of potassium iodide and starch in the absence of acid. Of course when acid was added and all of the available chlorine became liberated checks were readily obtainable. This was likewise the case when the same definite quantity of potassium iodide was added each time without acid and the solution immediately titrated We have found, however, that the theoretical quantity of thiosulphate necessary to complete the reaction and remove the taste as well as odor coincided always with the amount necessary to satisfy the total available chlorine in the chlorinated lime employed. For one period of chlorinated lime containing approximately 33 per cent. of available chlorine the theoretical quantity would be 0.28 lb. of crystalline thiosulphate or approximately 30 per cent. of the weight of the chlorinated lime. One need not be afraid to add an excess since even 100 lb. of thiosulphate in 1,000,000 gal. of pure water cannot be tasted. As a matter of fact we should strongly recommend the application of thiosulphate in quantities of half of the quantity of the chlorinated lime to be on the safe side at all times and to take care of all reasonable overdosing with chlorine.

The commercial sodium thiosulphate is about 98 per cent. pure. It is a colorless, odorless salt possessing a cooling taste, afterwards bitter. It is very stable in air below 92° F., but loses moisture above that temperature. It greatly exceeds the chlorinated lime in stability. The salt is readily soluble in water and neutral or faintly alkaline in reaction. The medicinal dose of thiosulphate is the same as that of the sodium sulphite. Formerly it has been used to a limited extent as a weak antiseptic. The price of the commercial preparation is about 1.85c per lb. in 100-lb. lots; it is therefore cheaper than chlorinated lime.

Summary

To summarize the advantages of the sodium thiosulphate over the sodium sulphite we would say that it is much more stable, much cheaper and that it requires less in actual weight to accomplish the same result. The combined cost of the treatment is within easy reach of a community since it adds but 40 per cent. to the cost of the chlorinated lime and the advantage of its application will best be appreciated in places where taste troubles are frequent. Even when less than the theoretical quantity of thiosulphate is added it is bound to lessen the frequency of complaints. A very important point to keep in mind when such treatment is resorted to is that the thiosulphate stops the germicidal action of chlorine the moment it comes into contact with the treated water. This is not of serious consequences, however, since we know positively that the destruction of bacteria by the chlorine is extremely rapid and in most cases practically completed in the first five minutes as a safe margin or even more when conditions warrant. When the chlorinated water is stored, the simple addition of the thiosulphate in solution will suffice, care only being required to obtain a fair distribution. There is not much chance for the thiosulphate to unite with substances other than chlorine, since those compounds have a pronounced chemical affinity. Where the treated water is directly discharged into the mains, without previous storage, provisions will have to be made to dose the treated water continuously with thiosulphate at a point where disinfection has been practically completed. The thiosulphate does not attack metals and therefore would not cause trouble in the dosing chamber as does the chlorine. Where quantities like 2 to 5 lb. of chlorinated lime are applied and the dosing can be made reasonably automatic the application of thiosulphate will hardly seem necessary. However, where larger quantities are required and taste troubles ensue our observations would lead us to recommend the application of sodium thiosulphate as a permanent procedure.

International Congress of Consulting Engineers

A congress or international meeting of consulting engineers and professional experts or referees is to be held during the Universal Exposition in Ghent, Belgium, July 17-22. It will be held under the auspices of the Belgian organization, Chambre Syndicale des Ingenieurs Consoils en matiere d'Installations Industrielles, of which R. E. Mathot is President, and Chas. de Herbais de Thun is Secretary. Membership in the congress will be in two classes, paying respectively 100 francs and 20 francs, with no difference in rights. However, anyone may secure the publications of the congress, without taking membership, by the payment of 10 francs. The question of founding a federation of consulting engineers' associations will be touched upon. Other parts of the program schedule are allotted to discussions on organization, professional questions, fees and charges, and related subjects. Subscriptions for membership should be sent to Mr. de Thun, 18 Rue Marie-Therese, Brussels, Belgium.

Ottawa's New City Engineer

Mr. Archibald Currie, City Engineer of Westmount, has been appointed to a similar position in the City of Ottawa, and will take up his duties on June 20th. The commencing salary is $5,000 per annum, to be increased to $6,000 after the first year. Mr. Currie has had a world-wide experience. Born in Glasgow he was educated in that city and at the West of Scotland Technical College, graduating in 1890. For three years he was assistant engineer for Sir John Aird & Sons, contractors, London, later being engaged by the Chinese Government as resident engineer in charge of important works in the north of China. He was in that country during the Boxer riots, and for his services in connection with the attempt to relieve the European legations in Pekin received a medal and clasps. From China Mr. Currie went to South Africa, where he remained for nine years, six of which he spent in Johannesburg, where he was in charge of electric railway, drainage and road construction. Mr. Currie then returned to Great Britain and as consulting engineer was engaged in water supply work and similar enterprises in Ireland, Scotland and Wales. Early in 1911 he was appointed City Engineer of Westmount in succession to Mr. F. L. Fellowes now city engineer of Vancouver. Mr. Currie is a member of the Institute of Civil Engineers, London, England, and also of the Canadian Society of Civil Engineers.

Tenders for Widening Aqueduct, Montreal

Eight tenders have been received by the City of Montreal for widening the aqueduct, from Lachine to Point St. Charles, a distance of six miles. The aqueduct has been once enlarged, this contract having recently been completed, but it has been decided to still further widen the waterway. Under the plans 10,000 horse power will be generated, 6,000 of which will be used for pumping the city's water supply, and the remaining 4,000 for lighting the city. There is also a proposal to build boulevards on each side of the banks, and the tenders give alternative prices for the work. Owing to delays arising over this proposal, the lighting part of the scheme will not come into operation for several years, as the work of enlarging the aqueduct will not be completed in time for the council to terminate the lighting contract in two years' time, and the council must therefore enter upon a second five years' agreement with the lighting company. The following are the tenders:

	With Boulevards	Without Boulevards
J. P. Mullarky, Montreal	[illegible]	[illegible]
Sir John Jackson Canada Ltd., Montreal	$4,225,593	[illegible]
Oscar Daniels Co., New York	[illegible]	[illegible]
Laurin Leitch Co., Ltd., Montreal ...	[illegible]	[illegible]
M. P. & J. T. Davis, Quebec	[illegible]	$3,191,557
Quinlan & Robertson, Montreal	[illegible]	[illegible]
Cook Construction Co., Ltd., Sudbury	[illegible]	[illegible]
O'Brien & Doheny, Montreal	$2,772,557	[illegible]

Contracts for [illegible] have been placed recently in New York by Messrs. [illegible]

& Company, New York for the Chile Exploration Company. The equipment at present comprises four 10,000 kw. Siemens generators coupled direct to four 14,300 P.S. Zoelly Steam Turbines of Escher Wyss manufacture. These units will run at 1500 r.p.m. when working with steam of 170 lbs. pressure and 185 Centigrade superheat. Escher Wyss & Company, Montreal, who are attending to the American business of their works at Zurich, have secured this order against competition from the foremost American and European makers, on the strength of the low steam consumption of their turbine. The plant is to be installed in Chile and the power used for electric smelting of copper ore. The transmission line, which is two hundred miles in length, will be for 110,000 volts pressure. Messrs. Siemens Schuckert Werke have been awarded the contract for the whole of the electrical equipment.

Winnipeg Makes Good Report

Correspondence of the Contract Record

In Winnipeg and the West generally conditions are satisfactory. It is apparent that there will be a sufficient volume of business to ensure a good season for the constructional interests. Money is not particularly scarce for legitimate building enterprises. The feeling in contracting and building circles is one of greater confidence. There is no exceptional demand for supplies and equipment. Trade is of an average character with shortage in some lines at western points. A general shortage in any particular line is improbable. The supply of cement is about equal to the demand. There is a considerable quantity of cement in storage at the head of the lakes and with the new $3,000,000 plant of the Canada Cement Company in operation there is little fear of a shortage.

Larger Building Projects

The Laura Secord School, estimated to cost $250,000, is nearing completion. This building will contain 25 classrooms and a large auditorium on the ground floor. The plans were prepared by Mr. J. B. Mitchell, and Messrs. Thos. Kelly & Sons are the contractors.

The Fort Garry Construction Company have the contract for an addition to the Machray School, estimated to cost $100,000. Worswick Bros. have the contract for an extension to the School Board offices, at $32,193. The Atlas Construction Company will erect a warehouse for P. R. Wallace at a cost of $45,800, according to the plans of J. H. G. Russell. Peterson Bros. have taken out a permit for a $60,000 apartment block, plans for which were prepared by E. W. Crayston. The West End Realty Company are building a $40,000 apartment house and the Wright Construction Company a $50,000 structure of the same kind.

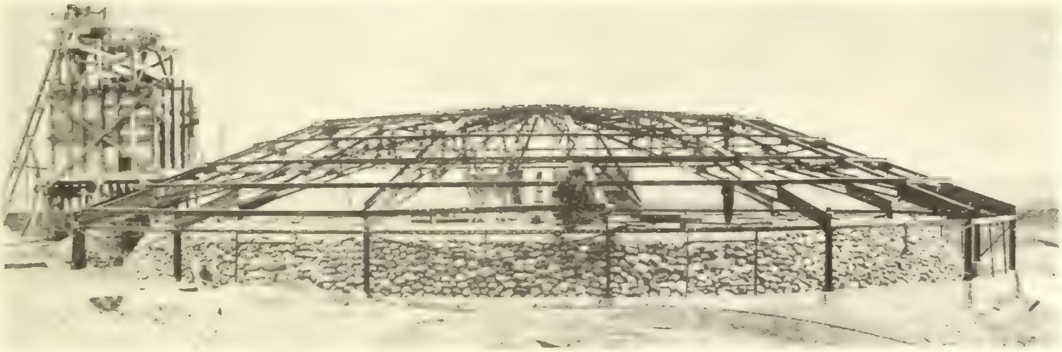
Canada Cement Company's New Plant

The new plant of the Canada Cement Company, previously mentioned, is situated a short distance outside the city and covers fifteen acres of ground. The clinker to be used in this plant will be shipped in from a point 120 miles northwest of Winnipeg, which is on an extension of the C. N. R. Oak Point Branch. The railway has been rushing the construction of this track so as to have it ready for the opening of the plant. The buildings now erected or under construction comprise a rock and clay storage plant 200 by 600 feet; dryer and kiln, 300 by 70 feet; raw grinding mill, 150 by 100 feet; machine shop and store-house, 36 by 135 feet; clinker storage, 70 by 198 feet; clinker grinding mill, 60 by 166 feet; two stock houses 200 by 120 feet; three-storey office building, 42 by 30 feet; bag house, 150 by 50 feet; coal-grinding mill, 50 by 50 feet. The total storage capacity is 500,000 barrels. Electric drive will be used in all departments of the plant.

Winnipeg Prices for Building Material

(Dealers' prices to contractors, delivered on job.)

Brick, pressed, per thousand	$25.00 to 50.00
Brick, enamelled, per thousand	100.00
Bricklayers' Cement (Austin's), carload lots, per bbl.	1.40
Building Paper, per roll	.75
Brick, kiln run, per thousand	$14.00
Brick, sewer, per thousand	15.00
Brick, chimney, per thousand	16.00
Brick, veneer, per thousand	16.00
Brick Sand Lime	13.00
Blackboard Slate, per foot	.30
Drain Pipe (farm) 3-inch, 0.5; 4-inch	.06
Fire Brick, per thousand	45.00
Fire Clay, per ton	20.00
Fire Proofing, per thousand brick measure	18.00
Flue Lining, 8½ x 8½, per foot	.25
Gravel, per yard	1.85
Hardwall Plaster, per ton	12.00
Hair (plaster), per bale	1.25
Hair Insulator, per bale	8.25
Hollow Brick, per thousand	14.00
Hollow Blocks (all sizes), per thousand brick measure	18.00
Hydrated Lime, per ton	12.00
Insulating Paper, per roll	1.25
Keene's Cement, per bag	2.25
Kelley Island Lime, per bbl. (3 bush.)	1.85
Lime, per bushel	.32
Gray Lime, per bushel	.35
Lath (metal)	.16
Lath (No. 1 pine)	5.75
Mortar Color, per lb.	.05
Menominee Red Sand Mould Brick, per thousand	26.00
Nails (wire) per keg	3.25
Nails (cut), per keg	3.25
Oriental Brick, per thousand	35.00
Paper (building), per roll	.75
Paper (tar), per roll	.90
Paper (sheathing), per 100 lbs.	4.25
Plaster, per ton	12.00
Plaster Board, per foot	.03
Plaster Bead, per foot	.05
Plaster of Paris, per bag	.75
Roofing Felt (2-ply), per roll	2.50
Roofing Tile, per foot	.15
Rubble Stone, per cord	13.00
Sand, per cubic yard	1.75
Shingles (B.C. Cedar, No. 1), per thousand	4.00
Shingles (B.C. Cedar, No. 2), per thousand	3.50
Sewer Pipe, 4-inch, per foot	.08½
Sewer Pipe, 6-inch, per foot	.16½
Terra Cotta, superficial foot	1.50
Terra Cotta Facing Blocks, per foot	.25
Wall Coping, per lineal foot	.35
Wall Ties (metal), per thousand	6.00
Weeping Drain Tile, per foot, 4-inch	.07
Wood Fibre Plaster, per ton	12.00
Lead Pipe, per lb.	.06½
Dry Colors:	
Red Lead, per lb., kegs	6.50
White Lead, per 100 lbs.	$7.00 to 7.75
Gasoline, in barrels, per gal.	.24
Boiled Linseed Oil, per gal.	1.13
Raw Linseed Oil, per gal.	1.08



Filter beds in course of construction at Regina.

From the Saskatchewan Capital

Correspondence of the Contract Record

BUILDING conditions are improving at Regina, and the work done to date compares very favorably with that done by the corresponding period of last year. The monthly Regina permits have shown a considerable advance over the corresponding periods of 1912, and municipal work is correspondingly active.

The provincial government has completed arrangements for the erection of a new jail about five miles north-east of the city. They have purchased a section of land and will erect a jail building at a cost of about $200,000.

The height of the Grand Trunk Pacific hotel is not yet settled. Originally it was to have been nine storeys, then ten, then twelve, and now it is announced that it will be fourteen. The excavation work for the hotel began on May 15th and will be rushed through to completion as quickly as possible. The Parsons Construction Company has secured the contract for the excavating. The basement will run to a depth of 26 ft. below the surface. Mr. Lyall, of the Lyall-Mitchell Co., the firm having the contract for the erection of the hotel; Mr. R. Wilson, who will superintend the erection of the hotel, and Mr. H. B. Rugh, architect, of Winnipeg, arrived in the city recently. The sub-contractors have to complete the excavation work by August 15th next. The estimated total cost is $1,500,000. Work is progressing satisfactorily on the erection of the Sherwood departmental store and the addition to the Glasgow House departmental store.

Now that the government has purchased a new site for jail grounds, the old jail will be torn down and the grounds will be converted into residential property. Hon. J. A. Calder, after a conference with Professor T. H. Mawson, the planning expert, announced that the jail property and other property immediately across the lake owned by the government, would be laid out along town planning lines. In all two hundred to three hundred acres of property will be set aside for this purpose by the government.

The new reservoir at Boggy Creek is rapidly nearing completion. It is estimated that this tank will hold sufficent water to supply the city for two days, without any pumping whatever. The tank is circular, having an inside diameter of 202 feet, and is 26 feet deep. From the new brick power house below the water will be pumped up into the tank through a large inflow pipe and from an outflow pipe will flow to the city by gravitation. Seven inches from the top of the tank is a large overflow pipe which will carry all surplus water back to the pump well.

The material required for the waterworks extensions is arriving and work will be commenced shortly on the laying of the mains through the Broad street subway. Immediately

Progress view of the R. C. Cathedral at Regina this is done the city will make arrangements for the paving of this long subway.

Mr. A. J. McPherson, chief highway commissioner of Saskatchewan, has started a movement for the organization of an engineering militia corps at Regina.

The [illegible] Von Patpatt Company are negotiating with the city council with a view to locating a sand-lime brick plant at Regina. It is estimated that the building for this industry will cost $20,000 and the machinery $80,000. A large United States stove concern is also negotiating with the officials with a view to locating in Regina. As soon as a definite arrangement is reached full particulars regarding building, plant, etc., will be given out.

The Saskatchewan Co-operative Elevator Company has let contracts for the erection of elevators to the value of [illegible] as follows:—Prince Albert Lumber Company, $112,000; Estimated labor, $112,000; Vulcan Ironworks, of Winnipeg, transmission machinery and cement for foundation work, $123,000; J. A. Ashdown Company, Winnipeg, hardware, $20,000; Metallic Roofing Company, Winnipeg, for sheet metal work, $30,000.

Canadian Bank of Commerce, Regina, now nearing completion.

The Presbyterians have decided to erect a new church in Regina, to be known as the Carmichael church. The cost of this building is not to exceed $50,000.

The Saskatchewan Government has decided to instal automatic telephones in Regina during the present summer.

A large apartment block to cost at least $200,000 is likely to be built in Regina in the immediate future. Architect Tripp, Scarth street, Regina, has the plans nearly completed. It is proposed to have at least sixty suites of from four to eight rooms each.

An addition which will practically double the accommodation of St. Mary's church will be built this summer at a cost of approximately $30,000.

The police commission of Regina are calling for competitive plans for the proposed police station to cost $180,000.

The Regina Board of Trade has requested the city council to materially improve the main roads leading out into the country.

The Regina city council has approved of the movement for an interprovincial Canadian Highway.

The city council of Regina has been asked to construct pavement on the streets in the wholesale and manufacturing district on the north side of the city. The matter is at present engaging the attention of the city commissioners.

Craftsmen, Limited, of Regina, have received the order for the fitting up of the new $1,000,000 departmental store now in course of erection at Regina. This firm has also secured the contract for the interior fittings for the Canadian Bank of Commerce building on Scarth street.

Constructional Progress at St. John

Correspondence of the Contract Record

St. John, N.B., May 23.

BUILDING operations in St. John are being conducted on an extensive scale this year and this, with the heavy construction work in progress, has created a scarcity of ordinary laborers. A feature that is quite new in connection with such work here is that sand is being imported by rail from a point forty-five miles out of the city. Hitherto the local supply has been adequate for all needs. A company is now being organized with $25,000 capital to provide crushed stone for building purposes. The high price of brick will have some effect upon the building of brick houses. The price of brick is nearly twice as high as in Ontario and the local yards will not be able to supply the demand.

With work now in progress and more to be begun soon there will be two million dollars' worth of building in progress on Prince William street this year. This includes the post office, a seven-storey warehouse for the McClary Manufacturing Company, two other large warehouses, the complete remodelling of one building for bank purposes and of another into a modern office building, and the erection of a new bank building across Market square from Prince William street.

The federal government has called for tenders for a new wharf at West St. John. A similar wharf is already under construction and must be finished by December. Warehouses must be placed upon it and grain conveyors provided as soon as possible. The new C. P. R. grain elevator and power house just behind it will be finished this year. The concrete chimney of the power house will be two hundred feet high. The walls of the elevator are now rapidly rising. Grain conveyors must also be erected at three other steamship berths at West St. John for next winter's business. The Canadian Pacific Railway Company has night and day crews with steam shovels at work filling in a large area on which tracks will be laid as soon as the work is completed.

It is reported that there is two hundred feet of mud at the point where it was proposed to construct a bridge for the St. John Valley Railway across the St. John River and that as a consequence the line may be brought all the way down on the west bank of the river. If this route is adopted it will mean the construction of a great railway and traffic bridge at the head of St. John harbor, which would also cost a great deal of money, but towards which the city would be willing to contribute.

The Molassine Company of Canada, with $250,000 capital, has been organized and will erect a factory at St. John. This is a branch of a company which has factories in England, Australia, South Africa, France and Germany. Three manufacturers in New York who are thinking of establishing branches in Canada are coming to St. John early in the summer to look over the situation here. Lockwood, Greene

& Company, of Boston, have had their engineers here getting data for plans for the mammoth new iron and brass manufacturing plant to be erected by T. McAvity & Sons, which will eventually employ one thousand hands.

There is unusual activity in building this year in the various towns in New Brunswick. Moncton will have a very busy year. The new buildings will include a new Baptist church to cost $50,000 or $60,000, additional plant for the I. C. R. shops, and many residences. A scarcity of houses is reported in many towns.

The St. John Railway Company is extending its line towards East St. John. The city is carrying on a considerable amount of new sewerage work. Contracts have been awarded for permanent paving and tenders will be called for more.

There is great activity in construction work on the St. John Valley Railway and the Fredericton and Minto Railway. A company has an engineer and staff at work testing valuable deposits of fire clay, coal and iron in Queens County.

Personal Mention

Mr. E. Holland has been appointed city engineer of Guelph, Ont.

Professor Mawson is at present in Calgary proceeding with the work of city planning there.

Mr. John O'Neill, city engineer of Fredericton, N.B., recently sent in his resignation to the city council.

Mr. Kenneth A. Dunphy, C.E., of Fredericton, has been appointed to the position of resident engineer of the C. P. R. of district No. 2 Alberta division.

Owing to ill health, Mr. D. McD. Campbell, has resigned his position as City Engineer of Sydney, N.B. Mr. Campbell expects to engage in private practice.

Mr. Alfred Noble, consulting engineer, New York City, has been engaged to report to the Dominion Government on the several routes surveyed for the new Welland ship canal.

Mr. Cecil S. Burgess, A.R.I.B.A., formerly of McGill University, Montreal, is in Edmonton as superintendent of architecture for the University of Alberta. Mr. Burgess will establish a department of architecture for the University.

Mr. A. D. Swan, assistant engineer to the Montreal Harbour Commission, has resigned. Mr. Swan will visit Chili, where he will report on various projects, including three harbours, for a large British syndicate. On the completion of his work, and after a visit to England, Mr. Swan will return to Montreal.

Messrs. Redmond & Beggs, architects and structural engineers, Toronto, have dissolved partnership. Mr. Neil J. Beggs has removed to new offices in the Cosgrave Building and M. G. D. Redmond to the Dineen Building. Both of these gentlemen were formerly members of the staff of the Toronto City Architect.

Mr. G. L. Guillet has been appointed associate professor of mechanical engineering at McGill University, and Mr. A. J. Kelley lecturer on surveying. The resignation is announced of Professor [illegible] of the Department of Railway Engineering, on his appointment as general manager of the General Railway Signal Company of Canada.

Mr. T. P. Howard, managing director of the Phoenix Bridge and Iron Works Company, Limited, has been elected vice-chairman of the Montreal branch of the Canadian Manufacturers' Association, and Messrs. W. F. Angus, Canadian Steel Foundries, Limited; F. H. Hopkins, Dominion Wire Rope Company, Limited, and Mr. R. H. McMaster, Steel Company of Canada, Limited, members of the executive committee.

Mr. Alfred Brittain, C.E., died in Montreal on the 7th inst. He was a member of the Montreal city engineering staff for 35 years, and as the assistant city surveyor was responsible for the city sewerage system. Mr. Brittain, who was English by birth, retired about ten years ago owing to ill-health. He was a life member of the Canadian Society of Civil Engineers and also a member of the American Society of Civil Engineers.

Mr. Stevens Haskell, of the firm of Marchand & Haskell, architects, of Montreal, died on the 20th of May, after a short illness. He was born at Haverhill, Mass., and ten years ago went to Montreal and joined the firm of Marchand & Haskell. He and his partner planned several important structures in the province of Quebec including some fine ecclesiastical buildings. Mr. Haskell, who was 41 years of age, was a member of the Council of the Society of Architects of the Province of Quebec.

Mr. A. A. Cox, the well-known Vancouver architect who formed one of the committee of award in connection with the successful design for the new university of British Columbia, has been commissioned by the provincial government to prepare plans for the new provincial buildings at Prince Rupert. It is announced that plans will be prepared and tenders invited without delay, the intention of the government being to erect the buildings this summer. Haddington Island stone will probably be used in the construction, and the cost is estimated at between $300,000 and $400,000.

Canadian Railroad Development

Good progress is being made on the G. T. P. hotel at Fort Qu'Appelle and considerable additions have been made to the original plans.

The work of completing the double-tracking of the C. P. R. main line between Montreal and Farnham, with the exception of the short stretch over the Lachine canal at Highlands, has been resumed. It is expected that will be finished by December next.

The elevated track of the C. P. R. at North Toronto, was used for the first time the other day by a freight train. This work is going rapidly ahead and will be completed within a few weeks. While the track is available for traffic there is considerable filling in yet to be done.

The Canadian Central and Labrador Railway seeks power to build a railway from Cochrane, Alta., in a north-easterly direction to a point at or near Cape St. Lewis on the Atlantic Coast, with a branch line to a point near the mouth of the Hamilton River, Quebec, and also a branch line to the City of Quebec.

Before the end of the present year the wooden bridges on the Esquimalt & Nanaimo Railway, Vancouver Island, between Victoria and Wellington, will be replaced with steel structures. The work in view for 1913 on this section of the line includes the erection of twelve steel bridges of the modern type.

Interviewed recently in regard to Toronto's union station, President Chamberlin of the Grand Trunk stated that he was unable at the present time to make any statement regarding when and where it would be built. The whole matter is waiting on the action of Parliament in regard to the incorporation of the Toronto Terminals Company, which is a company formed by the Grand Trunk and the Canadian Pacific for the purpose of building and operating the Union Station.

As a result of a judgment by Mr. Justice Guerin, Montreal, the work on the Central Railway of Canada, from Midland to Montreal, will be suspended pending a decision in the suit taken by Messrs. C. J. Wills & Sons, railway contractors, London, England, against the company.

Sir Thomas Tait announces that the Fredericton and Grand Lake Railway will be completed about August 1st. This line will connect Fredericton, N.B., with the coal mines at Grand Lake and will serve to provide manufacturers with a means of cheaper power and also provide an outlet through Fredericton for large quantities of coal from these areas.

Mr. A. M. Price, superintendent of the C. P. R. at Calgary, is making an inspection of the entire road in the west on a track automobile. Mr. Price has just returned from Lethbridge and reports that progress has been made on the newly constructed lines, and it is thought that by the end of the year there will be close on 374 miles of this new mileage completed.

At a cost of $3,742,059, the Soo line, in preparation for an expected increase of traffic and greater demand for rolling stock in 1913, will add 2,295 cars to its equipment, and with some of the new cars already arriving and pressure of manufacturers for prompt delivery of contracts, the company will have the full complement of new equipment in use well in advance of maturity of the grain crop.

Grand Trunk Pacific officials announce that steel has now reached the international line on the Regina-boundary branch and will be linked up with the Great Northern Railway as soon as the necessary formalities have been completed. The first train on this new service between Canada and the United States will cross the border in the near future, and it is understood that it will be a Canadian train.

Excursion to Alabastine Company's Plant at Caledonia, Ont.

On May 19th a party of supply dealers and plastering contractors from Toronto and Hamilton, numbering nearly a hundred, left Hamilton at 2 p.m. by special train for Caledonia, their objective being to make a thorough inspection of the Alabastine Company's calcining mill and gypsum block plant. The visitors were greatly interested in the crushing, grinding and calcining machinery. Other features of interest were the machinery for mixing ready prepared wall plaster and the process of moulding the gypsum block. Operations were carried on during the inspection so that an excellent opportunity was afforded of making close observation of the manufacturing methods. After looking through the plant the party made a trip to a mine, going down an incline to the floor of the mine, which is 80 feet from the surface. The visitors were able to examine only a small part of the workings which cover several acres and are reached by a network of some four miles of mine railway track. Particular interest was found in the electric drills, in the solid gypsum formation and in the method of double entry mining. The closing event of the day was a banquet in one of the rooms of the mine. After the repast, Mr. R. E. Haire, Secretary-Treasurer of the Alabastine Company, expressed his appreciation of the general interest of the trade as evidenced by the representative party that had taken the trip. Mr. George Gander, of Toronto, replied on behalf of the contractors, and Mr. Britnell for the supply dealers. Mr. O. A. Cole, Manager of Alabastine Hardmortar, Limited, also spoke briefly, as did Messrs. A. Heatley, Geo. Clapham and John Mowat, of the Builders' Exchange of the city of Hamilton.

Mainly Constructional

The News in Brief—From Coast to Coast

Building permits in Toronto for the first week in May reached a total of $693,700.

The Dominion Tire Company, Berlin, Ont., have decided to erect additional buildings at a cost of $50,000.

The Napanee Brick and Tile Company, Limited, has been reorganized with a capital of $100,000.

The town of Galt, Ont., require the sum of $70,000 for the extension of their waterworks system.

The Cleveland Manufacturing Company are to build a large stove and machine factory at Weyburn, Sask., to cost $250,000.

It is expected that the manufacture of Portland cement will be commenced on a large scale at Elk Creek, B.C., before the end of the year.

Finishing touches are being put on the Notre Dame Investment Company's building at Winnipeg which, when completed, will have cost $200,000.

The bricklayers in the prairie provinces have demanded an eight-hour day and 75 cents an hour, both these changes to come into effect on August 12th next.

The Canada Cement Company have decided to build a plant at Medicine Hat with a capacity of 4,000 barrels a day, instead of 2,000 as originally intended.

Tenders are now being asked for the erection of the men's block of the new barracks at Long Branch, Toronto, and it is expected that the work will soon be under construction.

Toronto held first place in Canada for the total of building permits for April, which amounted to $3,740,826, Montreal was second with $3,322,406, and Winnipeg third with $2,566,750.

A large deputation of labor interests waited on the Minister of Railways and Canals recently, asking that the material, or at least a portion of it, used in Welland Canal construction work, be stone.

The Dickson Steel and Bridge Company, of Edmonton, has been incorporated under the laws of Alberta, and will erect a plant for the manufacture of structural steel in the suburbs of Edmonton.

The Tofield Clay Products Company is preparing to open operations in the immediate future with a ten kiln per day plant at Tofield. This company has secured a forty-acre site on the Tofield industrial site section.

The building year so far has not been marked by any widespread labor agitation in western Canada. There is no scarcity in any line of labor, skilled or unskilled, in connection with the building and contracting industry.

Messrs. Galbraith & Cote, Montreal, have been awarded a contract for two highway bridges at St. Hyacinthe, P.Q. The bridges, constructed of steel with concrete piers, will cross the River Yamaska. The contract has been awarded by the St. Hyacinthe Town Council, the price being $48,000.

It is only the want of steel being supplied briskly that will keep the construction of the new viaduct at Sunnyside, Toronto, from being completed in two and a half months. Thirteen sections have been erected, but there are five more to put up yet in addition to two girder spans across the rail track.

A definite plan for the expenditure of the $100,000 grant for good roads by the Provincial Government of Ontario will be decided upon at once, according to reports from the York County Highway Commission. Over 80 miles are to be planned, much of the material for which is already contracted for.

Enough cement to construct the proposed ocean-to-ocean highway has been donated by members of an organization of cement manufacturers in session at Chicago. Each member agreed to give one per cent. of his annual output for three years. The subscription is estimated to be worth $2,500,000.

The contract for the erection of the new post office at Fredericton, N.B., has been awarded to Fraser & Macdonald, of Halifax, and work has already been commenced. This building is being erected at a cost of over $150,000 and replaces the present building which has been found inadequate on account of the increased business.

From the head office of the Hudson Bay Company in London comes word that operations on the new Winnipeg store will be commenced at once. The building will occupy the full block on Portage Avenue between Vaughan and Colony streets and will be six storeys high at first with provision for six more storeys. The foundation will be completed this summer and the steel work carried on through the winter so that the building is completed by August, 1914.

The Montreal Engineering Company, Limited, of Montreal, has been given a franchise by the Medicine Hat council to build and operate a street railway system. The franchise is for a twenty-year term, renewable for a further term of five years or more. Construction will commence June 1st and rushed to completion of the first nine miles of track. Power will be supplied by the City as alternating current or the company will install its own plant operated by natural gas supplied by the city.

Contracts have been awarded to the Pembina Quarries, Limited, operating at Entwistle, Alta., to supply the buff and grey sandstone to be used in the construction of the Arts building at the University of Alberta and a 17-room school house on the Hudson's Bay reserve in Edmonton. The stone will be dressed at the company's works in Edmonton and delivered as required. The force at the quarries will be increased to two hundred men as soon as the development work is completed.

The Pembina Coal Company, financed by English capital, which has expended $1,000,000 in equipping and developing its coal properties near Entwistle, Alta., sixty-five miles west of Edmonton, will build a model village near its works this season. Contracts have just been awarded for forty cottages, and otheres will be erected as soon as the preliminary work is under way. The best ideas of the housing plans worked out at Birkenhead and Port Sunlight, England, and Walkerville, Ont., will be incorporated in the general scheme.

That the $2,000,000 floating drydock placed at Montreal last fall is likely to prove to be a white elephant, is confessed by shipping authorities. It was thought that shipowners would use the dock for all repairs needed by vessels, but it has been found that no company will put a ship in the dock while there is the slightest chance of sending it to British ports for repairs. A case in point is that of the Elder-Dempster steamer Benguelo, which will get a much-required [illegible] when [illegible] South Africa where the work can be done by cheap black labor.

In connection with the Bell Telephone Company, the Town Council of Outremont, P.Q., have decided to construct an underground conduit system. Five tenders have been received for the work, namely, Mr. J. M. Gest, Montreal, $98,000, time limit 250 working days; R. T. Smith & Company, Montreal, $110,000, time limit October 1st, 1913; Standard Construction Company, Montreal, $91,500, time limit six working months; Dietrich, Limited, Montreal, $81,000, time limit September 30th, 1913; Bell Telephone Company, Montreal, $115,000, time limit ten months. Part of the cost will be paid by the latter company, whose conduit will be built alongside that of the council, the two being divided by a wall. The town requires conduits for a proposed system of distribution of light and power.

Dominion Goverment Estimates

Large Supplementary Appropriations

Liberal provision has been made for public buildings, Ontario's share amounting to almost $1,500,000.

No less than $4,000,000 has been provided for terminal elevators; $500,000 for Intercolonial Railway branches and $100,000 for experimental farms.

The amounts as proposed to be apportioned under the Highways Bill run from $527,201 for Ontario and $418,449 for Quebec to $19,584 for Prince Edward Island. In addition there is an appropriation of $25,000 for organization and payment of staff. The total for highways is now $1,500,000.

The question of the terminus of the Trent Valley Canal on the Georgian Bay is settled by a vote of $250,000 towards the work via the Severn, with an outlet near Midland and Port McNicoll. A $1,000,000 contract is to be let at once, and it is expected that the above vote will be expended this year.

Three and a half millions additional is asked for harbors and rivers, including half a million each for drydocks at Halifax and Esquimalt; $200,000 more for Port Arthur and Fort William; half a million each for harbor works at St. John, Vancouver, Victoria and Toronto, and $600,000 further for Victoria harbor.

Publications Received

A report upon the waterworks of Canada, compiled by Leo G. Denis, B.Sc., hydro-electric engineer of the Commission of Conservation, presents in a form readily available for reference the principal physical data respecting the various systems in existence throughout the country. In every case, details of population, source and method of supply, cost of construction and operation, etc., are given. The report is divided provincially, and immediately after the main body of the matter there are charts and tables summarizing the general information and emphasizing points of special interest, such as growth of the number of water supply systems, sources of supply, rates and consumption. Copies of this publication may be obtained upon application to Jas. White, Esq., Secretary, Commission of Conservation, Ottawa.

American Wire Wheel News, the publication of the American Steel & Wire Company, 72 West Adams street, Chicago, gives a complete resume of the art of making wire wheels for automobile use; also a description of every maker who is now in the market. This publication is interesting in that it shows the remarkable progress of the industry and exemplifies the tendency of the wire wheel to supersede the wooden wheel for automobiles.

The Weber Chimney Company, [illegible] an attractively illustrated catalogue outlining the main points in favor of their construction and containing interesting constructional details of their reinforced concrete chimneys. Weber coniform chimneys and the method of their construction, including the unit forms used, are patented. It is claimed for these chimneys that they can be erected in much shorter time than brick or steel structures. The company invite enquiries as to plans, specifications and other information.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Amherst, N.S.
Waterworks, cost $15,000, under consideration. Clerk, W. F. Donkin. By-law to be voted on May 30th.

Pavements and sidewalks, cost $85,000, contemplated by the town council. Clerk, W. F. Donkin. By-law to be voted on May 30th.

Sewage system, cost $25,000, under consideration. Clerk, W. F. Donkin. By-law to be voted on May 30th.

Beamsville, Ont.
Waterworks extensions planned by Town Council. Chairman Waterworks Committee, Mr. Schultz. Clerk, S. B. [illegible]

Calgary, Alta.
Track paving, cost $101,600. Clerk, J. M. Miller. Supt. of Plumbing, T. H. McCauley. By-law pased for purpose of laying sub-concrete base under street railway tracks.

Trunk sewerage system, cost $527,660, planned by City Commissioners. Clerk, J. M. Miller. Engineer, Geo. Craig. By-law passed.

Sidewalks and asphalt plant. By-law passed for the expenditure of $3,500 for the laying of sidewalks, and for the installation of an asphalt plant. Chief City Engineer, Gray.

Cowansville, Que.
Filtration plant planned by Municipal Council, c/o Secretary. Site has been purchased and plant will be erected immediately.

Edmonds, B.C.
Permanent roadways, cost $500,000, for Municipality of Burnaby. Clerk, Arthur G. Moore. By-law to be submitted to rate payers.

Kentville, N.S.
Extension of waterworks, cost $15,000, planned by town council. Clerk, J. Carroll. By-law carried by ratepayers May [illegible]

Leamington, Ont.
Tenders received by Clerk up to June 10th for construction of reservoir, 45 x 80 x 15½ deep inside, of reinforced concrete and roofed. Plans and specifications at office of Clerk, R. M. Selkirk.

London, Ont.
City council contemplate paving eight blocks. Mayor, C. M. R. Graham. Clerk, S. Baker. Engineer-in-charge, Asst. Engineer, H. A. Brazier. Asphalt or concrete.

New Glasgow, N.S.
Sewers, cost $40,000, planned by Council. Chairman St. Comm., J. S. Crockett. Engineer, Donald F. McLeod, New Glasgow, N.S. By-law to be submitted early in June. Vitrified clay trunk sewers 2 and 3 ft. pipe.

Paving, cost $25,000, Provost St. Chairman St. Comm., J. S. Crockett. Engineer, Donald F. McLeod, New Glasgow, N.S. By-law to be submitted about June 1st for money. Material to be used will be decided by council. Work will be done by day labor.

Oshawa, Ont.
Highway. Plans at office of Engineer, Frank Chappell, who will receive tenders until noon, June 7th, for cement, concrete highway, 15,000 sq. yards.

Ottawa, Ont.
Pavements. Mayor, J. A. Ellis. Controller, Mr. Nelson. Acting City Engineer, F. C. Askwith, City Engineers Office. Asphalt pavements on Rupert, Adelaide, Clarence and Church streets. Tenders received by Chairman, Board of Control, until May 29th.

Oakville, Ont.
Town council contemplate paving Colborne and Dundas streets. Mayor, J. T. Madden. Clerk, Chas. A. Bradbury.

Point Grey, B.C.
Municipal council will soon invite tenders for sewerage installation for the Eburne district. Min. Engr., M. Johnston.

St. Thomas, Ont.
Tenders received by City Engineer, M. Ferguson, up to May 30th, for approximately 12,300 sq. yds. concrete pavement with 9,900 ft. concrete curb. Approximately 3,300 sq. yds. brick pavement with 3,000 ft. of curb and gutter. Plans and specifications at office of engineer.

Paris, Ont.
Town council contemplate the purchase of waterworks supplies. Clerk, Thos. McCosh. Engineer, Mr. Brockbank.

Sarnia, Ont.
Roadway, Christina. City and Prov. Govt. will build a new macadam roadway one mile long. Plans will be prepared at once by Govt. Architect and tenders called. Mayor, Dr. Bell.

Sault Ste. Marie, Ont.
Walks. Tenders addressed to Mayor, T. E. Simpson will be received by Clerk, C. J. Pim up to June 2nd, for construction of about 116,000 sq. ft. cement concrete sidewalks. Plans and specifications at office of Engineer. Tenders to be marked "Tender for Cement Sidewalks."

Stratford, Ont.
Council will purchase mixers and other equipment required from Messrs. Wettlaufer Bros., 178 Spadina avenue, Toronto. Clerk, R. R. Lang, Engineer, A. B. Manson.

10,397 lin. ft. concrete sidewalks, cost $5,499.60, planned by city council. Mayor, C. N. Greenwood. Engineer, A. B. Manson. By-law passed.

The city council contemplate laying 2,171 sq. yds. Westrumite pavement on Norman street, $4,860.80; 1,460 sq. yds. concrete pavement on Lenton avenue, $2,172; 830 sq. yds. macadam pavement on John street, $748. Mayor, C. N. Greenwood. Engineer, A. B. Manson. Chairman Board of Works, Ald. H. Pauli.

Timmins, Ont.
Water system planned for the town for domestic purposes, water to be brought from either Moneta Mine, ¼ mile from town, or at suitable spot in in Metagami River, 1½ miles. Engineers Sutcliff & Neelands, New Liskeard, Ont. Mayor, D. W. Wilson. Clerk, F. M. Wilson.

Welland, Ont.
Sewers. Chairman Sewerage Committee, Jas. Hughes. Town Engineer, D. T. Black. Tenders received by Clerk, C. M. Webber up to noon June 2nd for separate sewers on North and West Main streets, Lock and Ross streets. Specifications and tender forms at Engineer's office. Plans and specifications at office of MacLean Daily Reports, Toronto.

Wingham, Ont.
Extension to waterworks system, cost $5,000, planned by the council. Mayor, Mr. Vanstone. Clerk, J. F. Groves. Ratepayers voted on by-law May 19th.

Tenders received by Clerk, John F. Groves, up to June 10th for reservoir, 40 ft. x 40 ft. x 12 ft. deep, and laying of 920 ft. 8-in. water pipe. Material furnished. Plans at office of clerk.

CONTRACTS AWARDED

Edmonton, Alta.
Sewers and laterals. Clerk, C. E. Cox. Engineer, Latornel. Contract was awarded to Gorman Glancey & Grindley, 752 4th street, for supplying 6 in., 15 in. x 24 in. pipe at $53,232. To Misho & Company, for installing part of system, $127,000, and to Hulbert & Wilson, 7 Whyte avenue east, for part of sewer at $45,361.

Water mains in Pine avenue and 22nd street, 6 in., 8 in. x 10 in., pipe used. Clerk, C. E. Cox. Engineer, A. S. Latornel. Work is being done by day labor.

Boulevarding, cost $125,000. City council. Clerk, C. E. Cox. General contractors, The Phoenix Construction Co., General Delivery, has received large contract and at present are working on Sinclair street.

Montreal, Que.
Asphalt sidewalks, planned by Board of Commissioners. Secretary, L. N. Senecal. Engineer, Geo. Janin, City Hall. Contract for 10 sections awarded to Messrs. Warner, Quinlan Co., 10 Guy Black, 14 sections, Sicily Asphaltum Paving Co., Ltd., 45 Prince street. 53 sections, City Engineer.

Sewers, cost $91,411, for 3rd section of Notre Dame de Grace main sewer. L. N. Senecal, Secretary Board of Commissioners. Engineer, Geo. Janin, City Hall. General contractor, C. H. Moineau, 166 St. Charles street.

Sarnia, Ont.
Paving. Mayor, Dr. Bell. General contractor, Wm. Ellis, at $1.49 per lin. ft. Part vitrified brick and part creosoted blocks.

Weston, Ont.
Sewage disposal works, cost $14,548, planned by town council. Clerk, J. H. Taylor. Engineer, T. Aird Murray, 303 Lumsden Bldg., Toronto. General contractor, F. F. Fry, 744 Gladstone Ave., Toronto.

Railroads, Bridges and Wharves

Ayr, Ont.
Bridge, for Counties of Waterloo and Oxford. Tenders received by Engineers, Bowman & Connor, 36 Toronto street, Toronto, and Berlin, Ont., Berlin until noon May 29th. (a) 1-75 ft. steel bridge. (b) concrete abutments.

Twp. Bertie, Ont.
G. T. Rly. Co. has been directed to construct a 30 ft. subway with 14 ft. headroom, at crossing of Thompson Rd., Twp. Bertie, Co. Welland, Ont.

Brampton, Ont.
Bridge and roadway, for town council. Tenders received by Engineer, W. M. Treadgold, up to June 9th for (a) 8,000 sq. yds. concrete roadway with concrete curb, (b) concrete arch bridge, (c) concrete retaining wall. Plans and specifications at office of Engineer.

Brandon, Man.
C. P. R. Co. has been authorized to construct bridges Nos. 34.4 and 5.9 on Brandon Sub. Div., Manitoba Div., Manitoba

Bronson, Ont.
The Central Ontario Rly. Co. has been authorized to construct spur lines from a point on its line near Bronson, mileage 113, to and into the premises of the Ontario Marble Quarries Co., Ltd.

Burlington, Ont.
J. G. Wilson, Supt. County Roads will receive tenders up to May 30th for 1 18-ft concrete bridge on County Road, 1½ miles north of Acton (Clarridge's Bridge), (2) excavating for abutments for Cooper's Bridge, Glenwilliams and for concrete floor, (3) 100-ft. steel span erected complete, except concrete floor for Cooper's Bridge. Plans and specifications at office of Supt., Reeves of Georgetown and Acton, or J. [illegible], Engineer, Guelph.

Cardigan Station, N.B.
C. P. Rly. Co. has been authorized to construct bridge No. 42.5 near Cardigan Station, N.B.

Twp. of East Garafraxa, Ont.
Steel highway bridge for County of Dufferin. Tenders received by Engineer, C. R. Wheelock, Orangeville, up to 9 p.m. June 7th. (a) 1 120-ft. single span through bridge; (b) 2 70-ft. spans, low truss, box cords. Further information from Engineer.

Fredericton, N.B.
Dredging. Plans at office of Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, who will receive tenders until June 4th for dredging at Buctouche, Rivers Mills, Boars Head, St. John Co., St. Andrews, St. George, St. Stephen.

Hornby, Ont.
C. P. Rly. Co. has been authorized to construct bridge No. 28.6, near Hornby, Ont.

Jordon, Ont.
G. T. Rly. Co.'s plans showing proposed location of station to be erected at Jordon have been approved.

Montreal, Que.
Dredging, for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until May 30th for dredging at G. T. Boating Club and Rivers du Loup en haut.

Twp. Norwich, Ont.
G. T. Rly. Co. has been authorized to construct siding for Borden Milk Co., Ltd., on Lot No. 10, Con. 5, Twp. Norwich, Ont.

Onondaga Twp., Ont.
Three bridges, cost $7,500, "Thompson," "Dixon" and "Tams," planned, steel and cement. By-law will be submitted. Twp. Clerk, Alfred Burrell, Onondago.

Ottawa, Ont.
Dredging. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until June 4th for dredging at Cloud Bay, Whitby, Bruce Mines, Hilton, Killarney, Little Detroit and Walker River. Plans, etc., at office of Secretary.

Ogilvies, N.S.
Extension to breakwater for Dom. Govt. Dept. of Public Works. Plans at office of Secretary and C. E. Dodwell, Halifax, E. G. Millidge, Antigonish, N.S. Tenders received by Secretary, R. C. Desrochers, Ottawa, until June 13th.

Penetanguishene, Ont.
G. T. Rly. Co. has been authorized to construct siding for [illegible]

Raleigh Twp., Ont.
Two bridges, cost $5,000, planned by Twp. Council. Clerk, A. E. Robinson, Buxton, Ont. Engineer-in-charge, W. G. McGeorge, C.E., c/o Clerk.

Sarnia Twp., Ont.
Bridge, cost $3,000. Engineer, S. A. Coad, Alvinston, Ont. Specifications and plans may be seen at residence of Reeve, A. Hillier, 8th Line. Steel bridge on concrete abutments, length 40 ft. x 20 ft.

Toronto, Ont.
Bridge, St. Clair avenue, planned by Board of Control. Mayor, H. C. Hocken. New tenders for concrete work.

Car shed, cost $36,000, Queen street east, for Toronto Street Railway, King and Church. Architect, H. G. Salisbury, 10 Adelaide street east. One storey, 100 x 360, brick and structural steel construction. Plans prepared.

Victoria, B.C.
Engineer C. E. Rust has been requested to prepare plans for the proposed Johnston street Bridge.

CONTRACTS AWARDED

Centreville, N.S.
Railway construction, to Weston, Kings Co., planned by Dom. Atlantic Railway Co. Manager, P. Gifkins, Kentville. General contractors, Kirk & Cook, Centreville. 16 miles, rails to be laid before October 1st, 1913.

Guelph, Ont.
Bridge, cost $11,000, Hefferman street. Clerk, T. J. Moore. General contractors, Galbraith & Cate, Room 44, 179 St. James street, Montreal. Cement construction.

St. Hyacinthe, Que.
Bridge, Morrison, planned by city council. Clerk, A. Messier. Engineer, L. A. Vallee, 80 St. Cyrille street, Que. General contractors, Galbraith & Cate, Room 44, 179 St. James street, Montreal. Steel structure with concrete piers.

Saskatoon, Sask.
Street railway, cost $67,000, for Saskatoon-Sutherland, Construction Co., Ltd., Royal Block. General contractors, Lonergan & Hansford, 127 19th street east. About 4 miles of construction 60 lb. rails, gauge 4 ft. 6½ in. Two miles of grading has been done.

Public Buildings, Churches, Schools, etc.

Amherst, N.S.
Armoury, Acadia street, planned by Dom. Govt. Dept. of Militia and Defence. Secretary, E. F. Jarvis, Ottawa. Ratepayers will vote on by-law May 30th, granting site.

Schools, cost $75,000, contemplated by the town council. Clerk, W. F. Donkin. By-law to be voted on May 30th.

Belleville, Ont.
11-room school for Board of Education. Chairman Building Committee, B. Mallory. Architects, Ellis & Connery, Manning Chambers, Toronto. Plans, etc., at office of Chairman and Architects. Tenders received by Chairman until June 9th.

Brampton, Ont.
Hockey rink, cost $10,000, for Thauburn, Dawson & Hodgson. One sty., 100 x 250, 3 ft. cement foundation, brick frame construction. Plans in progress.

Broadview, Sask.
City Hall, cost $25,000. By-law carried to erect city hall. Will include opera house and fire hall. Clerk, [illegible] Sinclair.

Brockville, Ont.
Moving picture theatre, cost $20,000, King street, for Jno. McLennan, Architect, A. Stuart Allaster. Two storeys, [illegible] concrete and brick construction.

concrete foundation. Plans being prepared.

Calgary, Alta.
Children's shelter, cost $50,000, Hatville Heights. Clerk, J. M. Miller. Architects, Lang & Major, Board of Trade Building, are preparing plans.

School, cost $150,000, contemplated by the Board. Building Supt., H. McCellan. Sandstone and reinforced concrete construction.

Cobourg, Ont.
$15,000 has been subscribed for the erection of a hospital. Plans will be prepared.

Cochrane, Ont.
Bank building, cost $17,000, 6th Ave., for Imperial Bank of Canada. Architect, W. E. Binning, Bank Architect, Cochrane. Supt. of Construction, J. Peugh. Excavating, Jno. Gooding. Two storeys, 36 x 48. Milton pressed brick construction.

Hamilton, Ont.
Hall and stores, cost $30,000, Main street, for Royal Templars of Temperance, Spectator Building. Architect, W. A. Edwards, 2 Hughson street south. Tenders will be called shortly.

Moncton, N.B.
Church, planned for First Baptist Congregation. Pastor, Rev. Mr. Lawson. Chairman Trustee Board, Geo. O. Spencer. Committee are now calling for competitive designs.

Oak Bay, B.C.
Theatre, cost $8,000, planned for The Victoria Motion Picture Co. Architects, Fleet & Beale, 1021 Government street. Concrete, brick and frame construction. Plans ready.

Ottawa, Ont.
Additions to Royal Mint, cost $100,000, Sussex, for Dom. Govt., Dept. of Public Works, Queen street. Secretary, R. C. Desrochers, Ottawa. Addition for gold refining quarters. Stone construction and foundation. Plans in progress.

Elevator and additions to East block contemplated by Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, Dept. of Public Works.

Tenders received by A. Johnston, Deputy Minister of Marine and Fisheries, until June 28th, for the construction of wooden lighthouse and dwelling combined and an oil shed at Shipwreck Point, Kings Co., P.E.I. Plans, etc., at this Dept. and Agency of Dept., at Charlottetown, and post offices, Summerside, Cardigan Bridge, Georgetown, St. Margaret's and Souris East, P.E.I.

Portage la Prairie, Man.
Church, for St. Josephs R. C. Congregation. Architect, F. R. Evans, 506 Somerset Bldg., Winnipeg. Plans prepared.

Stratford, Ont.
Tenders will be called shortly for the erection of a steel grandstand for the fair grounds. Address, Ald. Barnesdale, Chairman Fair Committee. Architect, Hepburn.

Toronto, Ont.
School. Tenders received by Secretary, W. C. Wilkinson, until May 27th on cabinet work on new Technical School.

Alterations to St. James Cathedral, cost $30,000. Rector, Rev. Canon Plumptre. Architects, Darling & Pearson, Leader Lane. Alterations include new concrete, tile and marble floors, heating, ventilating and lighting systems. Plans drawn.

Westboro, Ont.
Church, Sunset and River streets, for Westboro Baptists. Site has been purchased and plans will be prepared.

Windsor, Ont.
I.O.O.F. hall, cost $35,000, Wyandotte. Chairman of Board, Thos. Yates. Architects, Crane & Pennington, Boug Bldg. Three storeys, 52 x 90, stone and brick construction, seating. Plans in progress.

Wingham, Ont.
Armories, cost $25,000, planned by Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders to be called shortly.

Welland, Ont.
Church, cost $30,000, for R. C. Congregation. Plans are in hands of owners. Site purchased at the corner of Hellems ave. and Griffith street.

CONTRACTS AWARDED

Ayers Cliff, Que.
Church, cost $3,000, for Anglican Congregation. Architect, G. M. Moulton, Main street, Coaticooke. General contractor, Chas. Robinson, Ayers Cliff, Que. One storey.

Calgary, Alta.
College, cost $53,000, for St. Benedict College Trustees. Architects, Laing & Smythe, Beveridge Block. Heating and plumbing, Wm. Head & Co., Ltd., 233, 7th avenue west. Will require laundry machinery complete, water supply system, lighting system and septic tank. Work in progress.

Edmonton, Alta.
School, cost $155,500, for Public School Board. Architect, G. E. Turner, Mortlake Block. General contractors, Edinger, Simpson Construction Co. Two storeys, concrete foundation, brick construction.

Laundry and power house, cost $45,000, for Misericordia Hospital Board, 12th street and Victoria avenue. Architect, R. Percy Banie. General contractors, Cannell & Spencer Construction Co., 427 Jasper avenue west. Two stys., 40 x 98, concrete foundation, brick construction, concrete floors.

Grimsby, Ont.
Church, for Baptist Congregation. Architect, W. H. Radcliffe, Toronto. General contractor, M. B. Zimmerman. Two storeys, 36 x 48, brick, stone and cement foundation. Excavating started.

Hamilton, Ont.
School, cost $40,000, Sherman avenue north, for Separate School Board. Chairman, Jas. Reding, Commercial Chambers, James street. Architect, Robt. Clohecy, 226 John street south. Mason, Thos. Launders, 80 Chatham St. Foundations in.

Leamington, Ont.
Addition to school, cost $10,000, for School Board. General contractor, Walter Link. Two storeys, brick construction.

Mitchel, Ont.
Church, cost $6,200, for New Lutheran Congregation. Pastor, Thos. Bloedel. General contractor, Wm. Eizerman. Mason, John Avery. One storey and basement, 30 x 45, pressed brick construction. General contractor will sublet painting and heating.

Oshawa, Ont.
Separate school, cost $15,000, Simcoe north, planned by R. C. School Commissioners. Architects, Mallory & Thatcher, 31 Queen street west, Toronto. General contractors, H. Gay & Sons. Plumbing and heating, not let yet. Two storeys, 70 x 60, solid brick, brick foundation, billiard room and gymnasium.

South Edmonton, Alta.
Addition to hospital, cost $225,000, 8th street northwest. Architects, Wilson & Herrold, Whyte avenue. General contractors, Olson & Johnson, 648 3rd Ave. northwest. Five storeys, 64 x 153, concrete foundation, brick construction. Excavating done.

Three Rivers, Que.
Church, cost $75,000, or R. C. Parishioners. Architects, Viau & Venne, 76 Gabriel street, Montreal. General contractor, A. Dube. 75 ft. high, 100 x 180.

Victoria, B.C.
Theatre, cost $345,000, for Mr. McBridg. Architects, Rochefort & Sankey. General contractors, Pinner & McLellan, 428 Sayward Bldg., will receive tenders for various trades in the construction of the building.

Winnipeg, Man.
Theatre, Market street, for Pantages, Ltd. Architect, G. W. Northwood, Northern Crown Bank Building. General contractors, J. McDiarmid & Co., Canada Building.

Club house, Smith street, for The Knights of Columbus, 265 Portage Ave. Architect, J. D. Atchinson, Trust & Loan Bldg. General contractors, Frid Lewis & Co., Somerset Bldg. Four storeys, 76 x 120. Excavating started.

Addition to school, cost $100,000. Architect, J. B. Mitchell, William and Ellen streets. General contractors, Fort Garry Construction Co., cor Arlington and Ross streets. Three storeys and basement, 128 x 70, structural steel, stone and brick construction.

Business Buildings and Industrial Plants

Brampton, Ont.
Factory, contemplated for J. W. Hewetson Co., Ltd., Shoe Manufacturers, 88 Terauley street, Toronto. Three stys., 115 x 250. Negotiating for exemptions.

Hamilton, Ont.
Foundry and storage warehouse, Clark street, for Otis-Fensom Elevator Co., Victoria Ave. N. Architects, Stewart & Witton, H. P. & L. Bldg. Two storeys and basement, 200 x 45, 100 x 70, structural steel and reinforced concrete construction. Plans ready.

Ingersoll, Ont.
Factory, cost $30,000, contemplated for

Standish Mfg. Co., 11 Colborne street, Toronto. By-law will be voted on on May 28th to aid in locating plant for the manufacture of washing compounds.

London, Ont.

Lithographic factory, for H. J. Jones, 311 Wolfe street. Architects, McBride & Gilbert, Dundas and Richmond. Mason, Sing & Beer. Carpenter, Jones Bros., Hamilton Road. Other contracts to be let.

Montreal, Que.

Bank building, cost $25,000, St. Catherine and Darling streets, or City & District Savings Bank, 176 St. James street. Architect, A. H. Lapierre, 51 Trust & Loan Bldg. Three storeys, 25 x 50, concrete foundation, stone and brick construction. Plans in progress.

New Westminster, B.C.

Hotel planned. Four storeys, brick and mill construction. Tenders to be called about June 1st. Architect, Enil Guenther, 404 North West Trust Bldg.

Ottawa, Ont.

Addition and alterations to stores, for L. H. Poulin, Sparks street. Architect, W. E. Noffke, Central Chambers. Four storey addition, solid brick and stone construction. Plans in progress.

Office and warehouse, cost $9,000, for J. T. Blythe, 394 Bank street. 40 x 70, solid brick construction, cement foundation. Plans drawn.

Paris, Ont.

Livery stable, cost $4,500, for W. Hule, Mechanics street. Frame construction. Plans in progress.

Sherbrooke, Que.

Factory planned for Panther Rubber Co., manufacturers of rubber heels, soles, etc. Company has been granted loan and exemption from taxation by city for ten years. Expect to be in operation by July 15th. Machinery required.

St. Roch, Que.

Extensions planned for St. Roch brick yard. S. Gosselin is interested.

Sherbrooke, Que.

Car wheel foundry, planned by a syndicate in which P. McCullough is interested. Negotiations are under way for purchase of suitable site.

Shelburne, Ont.

Mr. J. H. Hall plans to re-equip the portion of his greenhouses destroyed by fire recently at a loss of $3,500.

Tilbury, Ont.

Plant contemplated for Canadian Forging Co. Ratepayers will vote on by-law June 9th for the purpose of assisting company to locate in Tilbury.

Toronto, Ont.

Store and residence, cost $[illegible], Davenport, for J. M. Cowan, in trust, 65 Adelaide East. Two storeys, 19 x 68, stone foundation, brick and structural steel construction. Plans drawn.

Factory, 22 Clifford, for Clark Mattress Co., c/o J. Clark, 570 Richmond West. Site purchased, 50 x 100, and plans will be prepared.

Hotel, cost $2,500,000, contemplated by Geo. Statler, Buffalo, N.Y. Site not yet selected.

Store and residence, cost $[illegible], for E. E. Rutherford, 2 King street east.

Architect, J. G. Hedges, 210 Clinton. Three storeys, 20 x 55, brick and structural steel construction, stone foundation. Plans drawn.

Warehouse, cost $3,000, for Pease Foundry Co., Ltd., 118 King East. Architects, Page & Warrington, Confed. Life Bldg. Three storeys, 26 x 48, structural steel and brick construction, cement foundation. Plans drawn.

Vancouver, B.C.

Laundry, cost $125,000, Quebec street and 6th avenue. Architect, G. B. Kaufman, 615 Hastings West. Three storeys, reinforced concrete construction, machinery to be installed to cost $50,000. Delivery system includes auto trucks and motor wagons. Plans prepared.

Victoria, B.C.

Store and apartments, cost $15,000, Craigflower and McPherson Roads, for R. Randall, 1526 Cook. Architect, Jesse M. Warren, 503 Central Building. Two storeys. Plans in progress.

CONTRACTS AWARDED

Brantford, Ont.

Rebuilding factory, cost $15,000, Sydenham, for Pratt & Letchworth Co., Ltd. Builders, P. H. Secord & Sons, Ltd. Foundry, 1-storey, 80 x 260, core room, 1-storey, 91 x 155, brick, frame, concrete and galvanized iron construction, cement foundation. Rebuilding parts of factory damaged by fire.

Blenheim, Ont.

Business block, cost $10,000. Owner and builder, A. W. Ross, Talbot street. Cement foundation, cement construction.

Calgary, Alta.

Department store, 7th Ave. West, or Calgary Furniture Company, Limited, 8 Ave. West. Architects, Brown & Vallance, Calgary. General contractors, Fyshe, Martin McNeil & Trainer, Dominion Bank Bldg. Work in progress.

Stores and apartments, cost $10,000, 14th St. West, for N. M. Haskim, 1st street west. General contractor, Taylor, 113 and 11th avenue east. Heating and plumbing, Thompson & Revell, 1347 14th avenue west. Two storeys, 35 x 50, brick, cement foundation. Foundations in.

Office and stores, cost $40,000, 8th Ave. West, for J. R. Lie & Co. General contractors, Moorehouse & Bishop. Electric, Cunningham Elec. Co., 2nd St. West. General contractors will do plastering. Two storeys, 50 x 130, brick construction, frame elevator.

Warehouse, for J. H. Ashdown Hardware Co., Ltd., 8th Ave. W. Architect, J. H. G. Russell, 1110 McArthur Bldg., Winnipeg. General contractors, Carter-Halls-Aldinger Co., 216 New Burns Block. Six storeys, 50 x 110. Foundations in.

Warehouse, cost $85,000, 11th Avenue East, for Massey-Harris Co. General contractors, Union Building Co. Plumbing and heating, Marr Plumbing & Heating Co., 1010 12th avenue west. Four storeys, 100 x 130, cement foundation, brick construction.

Edmonton, Alta.

Storage and apartments, cost $[illegible], Alberta ave. Architects and general contractors, Montgomery & McQueen, [illegible] Jasper ave. Two storeys, [illegible]

concrete foundation, brick veneer and mill construction. Excavating done.

Hamilton, Ont.

Remodelling building, Arthur street, for Canadian Drawn Steel Co., Arthur street. Architects, McPhie, Kelly & Darling, Bank of Hamilton Bldg. General contractors, Geo. E. Mills, King street east. One storey, 60 x 30.

Bank building and office, cost $15,000, Barton street east, or Royal Bank of Canada, Toronto. Architect, Kenneth G. Rea, 54a, Beaver Hall Hill, Montreal. General contractor, Richard Tope, 191 Robinson street. Supt., B. F. Richardson, 60 Market street. Two storeys, 65 x 48.

Bank, King East, for Bank of Nova Scotia, head office Toronto. Architects, Bond & Smith, 19 Wellington street west, Toronto. General contractor, Harris & Harris, Confed. Life Bldg., Toronto. One storey.

Langdon, Alta.

Hotel, cost $18,000, for Messrs. Stephen & Garrett, Langdon. General contractors, Moorehouse and Bishop, Calgary. Complete water system to be installed. Cement foundation, brick construction.

Lethbridge, Alta.

Warehouse, cost $125,000, for The International Harvester Co. General contractors, Lees & Biglo, Edmonton. 4 storeys, 125 x 125.

Montreal, Que.

Warehouse, cost $9,000, for Imperial Tobacco Co., 900 St. Antoine. General contractors and builders, Atlas Construction Co., 37 Belmont street. One storey, 80 x ..0, stone and metal foundation, concrete construction, galvanized iron roofing.

Store alterations, cost $5,500, for Lande Bros., 234 St. Lawrence Blvd. Builder, J. Gersovitz, 935 St. Dominique. Three storeys, 27 x 50. Part of old building being demolished for alterations

Alterations to factory, cost $50,000, 1604 Clarke street, for L. H. Timmins, Dom. Express Building. General contractors and builders, Atlas Construction Co., 37 Belmont street, will likely call for electric wiring tenders later. 4-storeys, 100 x 100.

Sarnia, Ont.

Alterations and addition to carriage factory. Owner and builder, H. McFee, Cromwell and Victoria streets. Equipment required.

Windsor, Ont.

Alterations to hotel, cost $4,000, for Geo. Smith, McDougall street. Architects, [illegible] & [illegible], [illegible] Bldg. Masonry, iron and steel, Thompson Bros. Carpentry, painting and interior fittings, Geo. Haugh. Roofing, Welsch Bros. Plasterer, Isaac Nolan.

Printing factory and flats, cost $10,000 Owners and builders, Faradis Vincent & Co., [illegible]. Three storeys, [illegible] x 42, galvanized iron roofing. Foundations in.

Store and flats, cost $[illegible]. Owner & builder, A. Martinbeau, 360 Gilford street. Three storeys, [illegible], brick and [illegible] foundation, felt and gravel roofing. Excavating done.

Factory, cost $[illegible], [illegible] Avenue, for Liquid Air Co., 1st Ave [illegible] Vias & Verre, 36 St Gabriel street. General contractor, O. Chauvin, [illegible] Darling street.

Ottawa, Ont.

Stores and residences, cost $7,000, [illegible]. General contractor & owner, [illegible] Landreville, St Albert. 45 x [illegible], brick construction. Plans in progress.

Toronto, Ont.

[illegible], cost $5,000, Dufferin, for A. B. Ormsby Co., Queen and George. Builders, Wickett Bros., 35 Deer Park Cres. [illegible] storeys, 28 x 50, brick construction, cement foundation.

Winnipeg, Man.

Store, cost $6,000, Selkirk street. Architect and general contractor, J. Krolick, 682 Flora street. One storey, 27 x 54, brick foundation and construction. Excavating done.

Residences

Calgary, Alta.

Residence, cost $15,000, for the Sacred Heart Church, Sunalta. Architect, J. J O'Gara, MacLean Block. Three storeys. Plans prepared.

London, Ont.

Alterations to residence, cost $5,000, Lyle and King Sts., for Miss N. Flynn, cor. Lyle and King. Architect, Vicar Munro, Bank of Toronto Building. Two storeys, 22 x 52, white brick construction.

Moncton, N.B.

Tenement, cost $12,000, Park, for Murdock MacLeod, Church street. Architect, W. C. Barnes. Excavation and foundations done by day labor, other contracts not let. 2½-storeys, 40 x 60.

Montreal, Que.

Flats, cost $9,500, for Isaie Lavoie, 2396 Drolet. Architect, L. Champagne, care owner. Three storeys, 50 x 40, cement foundation, felt and gravel roofing.

Residence, cost $7,500, Chapleau, for S. Christin, 185 Poupart. Architects, Doucet & Morrssette, 360 St. Catherine East. Three-storeys, 60 x 46, felt and gravel roofing. Plans drawn.

Montreal West, Que.

Residence, cost $9,000, Percival, for M. L. Jackson, Royal Bank, Montreal West. Architects, Benoit & Girard, 215 St. Catherine West, will receive tenders or general contract until May 31st. Two storeys and basement, 23 x 30, cement foundation, reinforced brick construction, asbestos shingle roofing.

Oak Bay, B.C.

Residence, cost $14,000, for Modern Homes Ltd. Architects, Jennings and Boulanger. 12-room brick construction. Plans ready.

Ottawa, Ont.

Apartment, cost $15,000, for A. S. Wickware, 7 Powell ave. Brick veneer construction, stone foundation. Plans in progress.

Flats and residences, cost $10,000, Goulbourn street, for Henry Letebrac, 70 Sweetland. Brick veneer construction, stone foundation. Plans in progress.

Residence, cost $12,000, Clemow, for J. F. Main, c/o Architect, J. Albert Ewart, 193 Sparks street. Brick veneer construction, stone foundation. Plans drawn.

Point Grey, B.C.

Residence, cost $11,000, Shaughnessy Heights, for Dr. W. T. Barrett, 709 Dunsmuir street. Architect, J. S. D. Taylor, 543 Granville street. 2½-storeys, stone foundation, frame construction. Plans prepared.

Sherbrooke, Que.

Residence, cost $8,000, Elizabeth, for Bruce Fletcher, Sherbrooke, Que. Architect, C. E. White, 137 Wellington street, is preparing plans.

Toronto, Ont.

Two detached residences, cost $8,000, Garden, for A. C. Bond, 985 Dundas St. Architect, E. Cavell, 182 Sunnyside. Two storeys, 23 x 50, brick construction, brick foundation. Plans drawn.

Residence, cost $3,000, Roselawn Ave., for Dr. J. A. C. Evans, Allendale. Architect, P. H. Finney, 79 Adelaide street E. 2½-storeys, 22 x 36, stone foundation, brick construction. Plans drawn.

Residence, $9,500, Lawrence Drive, for C. H. Dunning, 28 St. Leonards Ave. Architects, Chadwick & Beckett, 18 Toronto street. 2½-storeys, 30 x 40, brick and structural steel con struction. Plans ready.

Winnipeg, Man.

Apartment block, cost $60,000, Victor Street, for Peterson Bros., c/o Architect, Ew. Crayson, Ross Ave. Plans prepared.

CONTRACTS AWARDED

Calgary, Alta.

Residence, cost $7,000, Mt. Royal, for J. Cardell, c/o Builder. Architects and builders, Richards Bros. & Co., Box 1648. Two storeys, 32 x 37, cement foundation, brick construction. Excavating started.

Cayuga, Ont.

Three residences, cost $6,600. Builder and owner, S. H. Sternaman. Two stys., 28 x 30, frame.

Crescent Beach, Ont.

Residence, cost $6,000, for A. May, Pierce-Arrow Works, Niagara street, Buffalo, N.Y. General contractors, Hanna Bros., Fort Erie. 2½-storeys, frame and rough cast construction.

Hamilton, Ont.

Three residences, cost $10,500, Burris street. General contractor and owner, Thomas Allan, 211 Victoria Ave. N. Brick construction.

Montreal, Que.

18 flats, cost $16,000. General contractors and architects, Geo. Bail and E. Vincent, 102 Strathcona. Three storeys, 92 x 53, brick, felt and gravel roofing. Owners will receive tenders for heating, plumbing, roofing and electric wiring.

Residence, cost $7,000, 336 Parc Lafontaine. Owner and builder, Jos. Dagenais, 332 Parc Lafontaine. Three stys., 25 x 60, cement foundation, felt and gravel roofing. Excavating done.

Three flats, cost $10,000, Outremont, (Durocher). Builder and owner, C. Normand, 1026 Fairmount ave. Architect, Mr. Chausse, 17 Pagnuelo. Three storeys, 28 ft. 6 in. x 56 ft., pressed brick. Work started by day labor.

Residence, cost $28,000, Outremont, Dunlop, for C. H. Branchaud, 19 St. Famille. General contractor, D. M. Long, 39 Windsor. Foundations, John Quinlan & Co., 4412 St. Catherine. Plumbing, Cadieux & Briard, 1277 St. Dominique. Plaster, McNulty Bros., 182 Mountain. Three storeys, 44 x 68, cement foundation, cut stone and pressed brick construction.

Four 3-storey flats, cost $9,000, Verdun, 2nd Ave. Owner and builder, Joseph Legault, 291 Ethel. Three stys., 75 x 40.

12 apartments, cost $15,000, St. Lambert, cor. Notre Dame and Aberdeen. Owner and general contractor, Jos. Larivee, St. Hubert. Architect, L. J. Bigonesse, c/o Owner. Other contracts not yet awarded. Three storeys, 60 x 31, brick encased construction, cement foundation.

Flats, cost $7,000, Verdun (Verdun). Owner and builder, H. Martin, 438 St. Antoine. Three storeys, 21 x 40, concrete foundation, brick construction. Excavating started.

Three-storey flat, cost $5,000, Verdun. Owner and builder, I. Montpetit, 362 Church street. Three storeys, 36 x 43. Foundations in.

Three storey flats, cost $5,000, Verdun (Lasalle), for G. Daoust, 25 Prince St. Builder, H. Lanouette, 523 Panet street. Three storeys, 33 x 52, concrete foundation, brick construction. Excavating started.

Residence, cost $8,000, St. Denis, for Alfred Verville, 3597 St. Hubert. Architect, C. A. Reeves, 58 St. James. General Contractors, Latreille & Latreille, 3597 St. Hubert street. Three storeys, 25 x 40, stone foundation, brick construction.

Two pair semi-detached residences, cost $10,000, Westmount (Lansdowne Ave.).Architect, general contractor and owner, D. Farrell, 567 Grosvenor Ave. Two storeys and basement, 22 x 60, concrete foundation, brick construction.

Nine flats, cost $6,000, 744 Cartier St., for Chas. Laurin & Jos. Therrien, 468 Parc Lafontaine. Architect, Z Trudel, 238 St. Andre. Mason, carpenter and painter, Owner. Heating, plumbing and electric, D. Dugas & Co., 256 Visitation. Stone foundation, brick construction.

Three-storey flat, cost $9,000, Verdun. Builder and owner, P. Secours, 139 Galt street. Three storeys, 75 x 45.

Alterations to 2 flats, cost $8,000, Pine Ave., for Ross Realty Co., 117 Notre Dame West. Architect, Barott, Blackader & Webster, 508 New Birks Bldg. General contractors, Anglins, Ltd., 65 Victoria street. Two storeys, 45 x 62.

Residence, cost $10,000, Esplanade ave., for Fred Vincent, 207 Esplanade Ave. Architect, W. E. Doran, 189 Bleury. Roofing, Standard Roofing Co., 189 McCord St. Painting and glazing, Beaunoyer & Brouillet, 1387 St. Lawrence Blvd. Plastering, F. Beaudoin, 636 Drolet.

Residence, cost $12,000, Westmount (Argyle Ave.), for H. V. Shaw, c/o Jackson & Savage, 78 St. Peter. Architects and general contractors, White Construction Co., 215 Coronation Bldg. Electric, Robert Mitchell Co., Belair Ave. Three storeys, stone foundation, brick construction.

Residence, cost $40,000, for F. N. Beardmore, 148 McTavish street. Architect, H. C. Stone, 84 St. Francois Xavier street. General contractor, Jno. Stewart, Bethune street. Foundations in.

18 flats, cost $30,000, Esplanade. Builder and general contractor, Ubald Beaudoin, 1923 Mance. Plumbing, heating and roofing, Jos. Vaillancourt, 43 Laurier W. Electric, J. J. Valois, 2378 Hutchison. Three storey, 120 x 65. Foundations in.

Dwelling, cost $5,000. Owner and builder, Ben Fisher, 3206 Clark. Three storeys, 25 x 51, cement foundation.

Flat, cost $8,000, Verdun (Claude). Owner and builder, O. Dupont, 312 Gertrude. Three storeys, 30 x 45.

Flat, cost $8,000, Verdun. Owner and builder, V. Saurette, 408 Gertrude. 3-storeys, 40 x 65. Excavation started.

Flats, cost $8,000, Verdun (St. Joseph). Owner and builder, I. Proul, 169b Galt. Three storeys, 62½ x 43.

Ottawa, Ont.

Apartments, cost $11,000, Waverly, for A. N. Young, c/o General Contractors. McDairmid & Tyndall, 243 Flora. 24 x 53, art stone construction.

Residence, cost $5,000, Sunnyside, for O. Bennett, 204 Sunnyside. General contractor, J. A. Meldrum, 45 Hopewell. 24 x 36, brick.

Port Arthur, Ont.

Residence, cost $6,000, for Harry Ruttan, 2 Court street south. Architect, H. Russell Halton, Shanley Block. General contractor, J. L. McRae. Two stys., 26 x 32, frame construction.

Sault St. Marie, Ont.

Residence, cost $6,000, Simpson. Builder and owner, Geo. Woolrich, Queen street. Two storeys, 30 x 42, wire cut brick construction.

Toronto, Ont.

Two detached residences, cost $6,000, Biggar. Owner and builder, W. Edmonds, 46 Eleanor. 2½-stys., 24 x 32, brick construction, stone foundation.

Ten pair residences, cost $40,000, Hastings. Builders and owners, Toronto Supply Co., 131 Ivy Ave. Two storeys, 34 x 42, brick construction.

Two detached residences, cost $8,000, Hastings. Builders and owners, Toronto Supply Co., 131 Ivy Ave. 2½-storeys, 20 x 38, brick construction.

One pair and 1 detached residences, cost $6,000, Boston. Builder and owner, Geo. Nicholson, 6 High Park Gardens. Two storeys, 20 x 36, each, brick construction.

One detached residence, cost [illegible], Wychwood. Architects and builders, Eden Smith & Son, 199 Yonge street. General contractors, Thomas Bros., Dupont and Christie. 2½-stys., 23 x 36, brick construction and [illegible]

Winnipeg, Man.

Residence, cost [illegible]. Owner and builder, F. W. Walker, 326 Kingsway. [illegible] stone foundation, brick construction.

Residence, cost [illegible]. Owner and builder, F. W. Walker, 326 Kingsway. [illegible] foundation, pressed brick construction.

Residence, cost [illegible] Crescent Ave., for W. A. Hossie, c/o Architect, W. S. Bridgeman, Canada Life Building. General contractors, Claydon Bros., Furby Place, 48 x 60, stone foundation, stone and frame construction.

Residence, cost $6,000, Montrose St. Architect and builder, G. W. Ferguson, 201 Walnut street. 2½-storeys, 24 x 30, stone foundation, frame construction.

Apartment block, cost $50,000, Grosvenor and Ainelia streets. Architect and general contractor, Breston S. Wright, 104 Warwick Apartments. Three stys., 50 x 20, stone foundation, brick construction.

Power Plants, Electricity and Telephones

Aldborough Twp., Ont.

Southern Ontario Gas Company contemplates laying new gas mains through above township into St. Thomas and London, franchise has been granted.

Berlin, Ont.

Power house, cost $50,000, contemplated by the Dominion Tire Co.

Bowmanville, Ont.

R. G. Sturgeon & Co. wish to purchase lighting equipment for country residence, plant to generate about 40 volts, and to work in connection with gasoline engine. To be so constructed that a system of 15 lamps may be lit from either dynamo or accumulators.

Dundas, Ont.

The Hydro-electric System contemplate the purchase of two transformers and equipment. Chairman, R. W. Karch

Ottawa, Ont.

Alterations to power plant of J. R. Booth, lumber merchant, are under construction.

Windsor Mills, Que.

Canada Paper Co., Windsor Mills, Que., have purchased power known as Kingsey Falls site on St. Francois River, near Windsor Mills, Que., and will erect dam and power house this summer, and supply electric power for their mills at Windsor Mills.

Miscellaneous

Quebec, Que.

Copper wire, etc., for city council. Sec. Fire Comm., Auguste Malouin. Contract for 2,000 ft. fire hose at 95c per ft. awarded to Rene Talbot, 89 Dalhousie street, "Arrow Brand." 15 miles copper wire, for fire alarm telegraph, awarded to Messrs. Bosse & Banks, 39 St. Paul, supplies for 1 year for fire automobiles, to Messrs. P. T. Legare Co., 273 St. Paul street.

Business Notes

Cainsville, Ont.

[illegible] Park Farm. Owned by Dom. Canners, Ltd., Hamilton. Manager, O. Herold, Bow Park Farm, were destroyed by fire. Loss, $30,000. Insurance, $64,000. Will probably rebuild.

Calgary, Alta.

Factory of the Alberta Box Co., cor. [illegible] Ave. and [illegible] street east, damaged by fire. Loss, $12,000.

Inverness, N.S.

Queen's Hotel burned, loss $20,000. A. J. Campbell, owner. Insurance, $6,000.

Moncton, N.B.

Parsonage of Moncton Baptist Congregation burned. Pastor, Rev. G. A. Lawson. Loss, $12,000; insurance, $8,000. Will rebuild immediately.

Skating rink. Owned by A. E. Holstead, burned. Loss, $6,000; insurance, $4,000. Will rebuild this summer.

Hall and class rooms. Owned by Brotherhood Hall Society, burned. Pres., Rev. G. A. Lawson. Loss, $10,000; insurance, $8,000.

Plessisville, Que.

Foundry of The Plessisville Foundry Company burned. Loss $150,000, insurance $60,000. Will rebuild. Entire plant will be required.

New Companies

H. A. Ogilvie, Limited, incorporated with a capital of $100,000, to carry on business as lumbermen, sawmill proprietors, builders, etc., with head office at South Porcupine. The provisional directors are G. H. Sedgewick, A. G. Ross and A. E. Langman, barristers, all of Toronto.

Goodwood Realty Company, Limited, has been incorporated with a capital of $40,000, to carry on a general land and building business with head office at Toronto. The provisional directors are J. J. Flint, accountant, G. D. Waters, cashier, and J. H. T. Nesbitt, bookkeeper, all of Toronto.

Liverpool Land Company, Limited, has been incorporated with a capital of $40,000, to carry on business as a general land and building company, with head oce at Toronto. The provisional directors are J. G. Shaw, P. A. Edge and Jos. Montgomery, barristers, all of Toronto.

The Dominion Clay Products Company, Limited, has been incorporated with a capital of $150,000, to carry on business as manufacturers and dealers in building material, electricians, engineers, builders and contractors in all branches with head office at Toronto. The provisional directors are C. Wfl Garthwaite, accountant, J. A. Courtice, realty broker, and J. H. Hallett, chemist, all of Toronto.

Waterloo Brick & Tile Limited, incorporated with a capital of $75,000, to manufacture and deal in lime, cement, terra cotta and all kinds of building material, with head office at Toronto. The provisional directors are J. S. Nicholson, broker, Jno. Lucas, merchant, and Chas. Simpson, brickmaker, all of Toronto.

The A. K. Wismer Carriage Company, Limited, has been incorporated with a capital of $40,000, to carry on business as carriage builders and manufacturers and dealers in woodenware of all kinds, lumber and building material, with head office at Jordan, Ont. The provisional directors are A. K. Wismer, Morgan Wismer, manufacturers, and E. C. Snure, [illegible], all of Jordan.

[illegible] Company, Limited, has been incorporated with a capital of $100,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are G. D. Waters, cashier, J. J. Flint, and J. T. H. Nesbitt, bookkeepers, all of Toronto.

Tenders and For Sale Department

[illegible] Sault Ste. Marie, Ont.," [illegible] Wednesday, June 11, 1913, for the installation [illegible] for generator set, penthouse, enclosure, foundation, etc.

Tenders will not be considered unless made [illegible] and in accordance with conditions contained therein.

Plans and specifications to be seen on application to Mr. P. J. Racine, Caretaker, Public Building, Sault Ste. Marie, and at the Department of Public Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,
Secretary

Department of Public Works,
- 42111. Ottawa, May 22, 1913. 22-23

Tenders for Sewerage Works

City of Sault Ste Marie, Ontario

Sealed tenders, fully endorsed and marked "Tender for Sewerage Works," addressed to T. E. Simpson, Mayor, Sault Ste. Marie, Ont., will be received by the City Clerk up to seven o'clock p.m. on **Monday, June 9th, 1913**, for supplying and laying about 18,000 lineal feet of tile sewer pipe with appurtenances.

Specifications and plans may be seen, and all information and forms of tender obtained at the office of the City Engineer, Sault Ste. Marie, Ont.

A marked cheque for 5 per cent. of the amount of the tender, payable to the order of the City Treasurer, must accompany each tender.

The lowest or any tender not necessarily accepted.

C. J. PIM, City Clerk.
W. W. VAN EVERY, City Engineer.
22-23

Tenders for the Construction of Sewers

Sealed tenders will be received by Mr. C. M. Webber, Town Clerk, Welland, Ontario, up to noon on **Monday, June 2, 1913**, for the construction of Separate Sewers on the following streets:

North and West Main streets; Lock street; Ross street.

Specifications and tender forms may be had at Engineer's office, Welland. Plans and specifications may also be seen at office of Contract Record & Engineering Review, 220 King Street West, Toronto.

A marked cheque for 10 per cent. of the amount of the tender must accompany each tender or an acceptable bidders bond of same value will be accepted.

The lowest or any tender not necessarily accepted.

JAMES HUGHES,
Chairman Sewerage Committee.
Welland May 17th, 1913. 21-22

TENDERS

Tenders will be received by the undersigned until 5 p.m., **May 30th**, for the following works:

Approximately 12,300 sq. yds. Concrete Pavement, with 9,900 feet of Concrete Curb.

Approximately 3,300 square yards Brick Pavement, with 3,000 feet of Curb and Gutter.

Plans and specifications and all information may be had at the office of the City Engineer.

M. FERGUSON,
City Engineer.
St. Thomas, May 19, 1913. 21-22

CITY OF SASKATOON

Sedimentation Basin

Invitation to Tender

Sealed tenders, addressed to the City Commissioners, Saskatoon, and endorsed on the envelope "Tender for Sedimentation Basin," will be received for the construction of the said Basin until twelve o'clock noon on **Friday, the sixth day of June, 1913.**

Plans, specifications, instructions to bidders, general conditions and form of agreement may be seen at the office of George T. Clark, City Engineer, Saskatoon, or will be forwarded on receipt of a marked cheque for $15, which will be refunded if plans are returned with the tender.

Bidders must forward a marked cheque or a deposit in cash for five per cent. of the total contract price with their tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved Surety Company.

The lowest or any tender not necessarily accepted.

F. E. HARRISON, Mayor,
Chairman of Commissioners.
Saskatoon, May 8th, 1913. 21-22

TENDERS

Tenders will be received until **Thursday, June 12th**, at 12 o'clock noon, for the supply and delivery of the following materials for sewer and water extensions in the City of Prince Albert.

(A) Approximately—
2,520 lin. ft. 10-in. cast iron water pipe.
21,700 lin. ft. 8-in. cast iron water pipe.
26,300 lin. ft. 6-in. cast iron water pipe.
43,000 lbs. special castings.

(B) 7—10-in. gate valves.
63—8-in. gate valves.
67—6-in. gate valves.

(C) Approximately—
754 lin. ft. 15-in. sewer pipe with junctions.
6,324 lin. ft. 12-in. sewer pipe with junctions.
6,568 lin. ft. 10-in. sewer pipe with junctions.
39,662 lin. ft. 8-in. sewer pipe with junctions.

Tenders shall be addressed to C. O. Davidson, Esq., City Clerk, Prince Albert, Sask.

Specifications and full information may be obtained from the City Engineer.

The city reserves the right to reject any or all tenders.

N. W. MORTON,
C. O. DAVIDSON,
F. A. CREIGHTON, City Commissioners.
M. H. BAKER, City Engineer.
Dated at Prince Albert, Sask.,

Tenders for Highway Bridges

Sealed tenders, marked "Tender for Grand River Bridges," will be received by the undersigned up to 9 p.m. on **Saturday, June 7th, 1913**, for the construction and erection of the following steel highway bridges in the Township of East Garafraxa:—

1.—A 120-foot single span through bridge.
2.—Two 70-foot spans, low truss, box chords.

A form of tender and all information may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHEELOCK,
County Engineer,
Orangeville, Ont.
Orangeville, May 17, 1913. 21-22

CITY OF MOOSE JAW, SASK.

Tenders for Paving

Sealed tenders, marked "Tenders for Paving," addressed to the City Commissioners, Moose Jaw, will be received up to 12 o'clock noon on **Friday, June 6th, 1913**, for the laying of approximately **17,000** square yards of pavement.

Plans, specifications and any other information may be obtained on application to the City Engineer.

Marked cheque for 2½ per cent. of contract price must accompany each tender.

Lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
Moose Jaw, Sask.,
May 20th, 1913. 22

Hydro-Electric Power Commission of Ontario

Wasdell's Falls Power Development

Sealed tenders, addressed to the Hon. Adam Beck, Chairman, Hydro-electric Power Commission, Continental Life Building, Toronto, will be received up to noon of **June 16th, 1913**, for the various classes of work in connection with construction and equipment of a hydro-electric power plant at Wasdell's Falls, on the Severn River.

Separate tenders will be received under the following heads:—
Tender for Dam and Power House.
Tender for Electrical Equipment.
Tender for Hydraulic Equipment.
Tender for Crane.
Tender for Stop-log Winch.
Tender for Head-Gate Mechanism.

Plans, specifications and instructions to bidders may be obtained at the offices of the Hydro-Electric Power Commission, Continental Life Building, Toronto.

Tenders for Dam and Power House must be submitted on Form of Proposal supplied by Commission.

An accepted cheque for Five Dollars, payable to the Secretary of the Commission, must accompany all requests for plans and specifications for Dam and Power House, said cheque to be held until plans and specifications are returned, either with or without a tender.

By order,

W. W. POPE, Secretary.

This advertisement will not be paid for unless inserted by authority of the Commission. 22

Extension of Time

TOWN OF BRAMPTON

TENDERS

Sealed tenders addressed to the undersigned will be received up to 6 p.m., **Monday, June 16, 1913**, for the construction of the following:

A.—5,000 square yards concrete roadway with concrete curb.

B.—Concrete Arch Bridge.

C.—Concrete retaining wall.

Plans and specifications may be seen at office of Town Engineer, Municipal Buildings, Brampton, Ont. Marked cheque for 5 per cent. of amount must accompany each tender. Separate tenders required for the different works. No tender necessarily accepted.

W. M. TREADGOLD,
Town Engineer.
Brampton, May 20, 1913. 21-22

Town of Oshawa, Ontario

Tenders for Cement Concrete Pavement

Sealed tenders will be received up to twelve o'clock noon of **Saturday, the Seventh day of June, 1913**, for the construction of Cement Concrete Highways, approximately 15,000 sq. yds.

Plans may be seen and specifications obtained at the Town Engineer's office, Town Hall, Oshawa, Ont.

A certified cheque for three per cent. of the contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

FRANK CHAPPELL,
22 Town Engineer.

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Trenton, Ont.," will be received until 4 p.m., on **Tuesday, June 10, 1913**, for dredging required at Trenton, Ont.

[illegible] signatures of the tenderers.

[illegible] from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been noti[illegible]

[illegible] the order of the Honourable the Minister of [illegible] contract price, which will be forfeited if the [illegible] the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
[illegible]
Secretary.
[illegible]

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. [illegible]

Sealed Tenders

Sealed tenders will be received up to **Monday, 8 p.m., June 19th, 1913**, for the construction of Twenty-five thousand feet, more or less, Cement Concrete Sidewalks in the Village of New Hamburg. Particulars can be had by applying to the town clerk.

J. F. KATZENMIER,
21-24 Clerk.

Special Notice

Every m n who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders for Dredging

Sealed tenders addressed to the undersigned, and endorsed "Tender for Dredging, Ontario," will be received until 4 p.m., **Wednesday, June 4, 1913**, for dredging required at the following places in the Province of Ontario

Cloud Bay, Whitby, Bruce Mines, Hilton, Killarney, Little Detroit, Walker River.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

A separate cheque for each place for which a tender is submitted must accompany the tender. This cheque must be equal to five per cent. (5 per cent.) of the amount of the tender, based on the approximate quantities set opposite the name of place, but in no case must the cheque be for a less sum than $1,500. The cheque must be accepted, on a chartered bank, and payable to the order of the Honourable the Minister of Public Works. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept [illegible]

By order,
[illegible]
Secretary.
[illegible]

Newspapers will not be paid for this advertise[illegible]

Tenders for Reservoir

Tenders will be received by the undersigned up to four o'clock p.m. on **Tuesday, June 10th, 1913**, for the construction of a concrete reservoir, 40 ft. x 40 ft. and 12 ft. deep. Plans and specifications can be seen at the office of the undersigned. The lowest or any tender not necessarily [illegible]

JOHN F. GROVES,
22-23 [illegible]

Tenders for Laying Water-pipe

up to four o'clock p.m. on **Tuesday, June 10th, 1913**, for the laying of 920 feet of 8-in. water pipe. Corporation to furnish all material; contractor to furnish all labor and tools. Plans and specifications can be seen at the office of the undersigned. The lowest or any tender not necessarily accepted.

JOHN F. GROVES,
22-23 Clerk, Town of Wingham.

CITY OF MOOSE JAW, SASK.

Tenders for Cement Sidewalks, Curb and Gutter

Sealed tenders marked "Tenders for Cement Sidewalks, Curb & Gutter," addressed to the City Commissioners, Moose Jaw, will be received up to 12 o'clock noon on **Friday, June 6th, 1913**, for the laying of approximately:

[illegible] lin. ft. of combined curb and gutter.

Contract "B"—128,000 sq. ft. sidewalk; 21,400 lin. ft. of combined curb and gutter.

Plans, specifications and any other information may be obtained on application to the City Engineer.

Marked cheque for $2\frac{1}{2}$ per cent. of contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

JAMES PASCOE,
L. W. RUNDLETT,
W. F. HEAL, City Commissioners.
[illegible]

CITY OF WINNIPEG

Tenders for Second-Hand Bridge for Winnipeg River

Tenders will be received up to noon on **Friday, June 6th, 1913**, [illegible] track, through truss, steel railway bridge, with [illegible] must be in good condition and be able to safely [illegible] rigid wheel base of 14 feet, 10 inches, followed by [illegible] of track.

Tenders shall give full description of bridge, stating age, condition, name of manufacturer, location, type, whether pin connected or rivetted, [illegible] delivery shall be stated.

Prices to be F. O. B. Lac du Bonnet, C.P.R., [illegible]

TOWN OF BROCKVILLE

TENDERS

[illegible] "Tender for Paving [illegible] street," will be received by the undersigned [illegible] June 5th, 1913, for the [illegible] Perth street.

[illegible]

The lowest or any tender not necessarily accepted.

G. H. BRYSON,
Brockville, May [illegible], 1913. Town Engineer.
[illegible]

Tenders for Pavements

CITY OF BERLIN

Sealed tenders, addressed to A. H. Millar, City Clerk, will be received up to 5 o'clock p.m., **June 12, 1913**, for approximately 8,400 square yards of Asphalt or Bitulithic Pavement; approximately 6,400 square yards of vitrified brick street car track allowance and 6,800 lineal feet of curb and gutter.

Plans and specifications may be seen at the office of the City Engineer after May 30.

The lowest or any tender not necessarily accepted.

HERBERT JOHNSTON,
22-24 City Engineer.

Tenders for Paving

Tenders, separate and en bloc, will be received up to 4 o'clock p.m. on **Tuesday, June 10th**, for the following works:

1. The construction of a storm sewer on Josephine street in the Town of Wingham, according to the plans and specifications prepared by T. Harry Jones, C.E., of the city of Brantford.
2. The work of excavating, paving with concrete and curb-stones on Josephine street in the Town of Wingham, according to the plans and specifications prepared by T. Harry Jones, C.E., of the city of Brantford.

The town will furnish road roller, stone crusher, screens and bins.

All tenders to be addressed to the undersigned by registered post. Plans and specifications can be seen at the office of the undersigned in the Town Hall, Town of Wingham.

The lowest or any tender not necessarily accepted.

JOHN F. GROVES,
[illegible] Clerk, Town of Wingham.

Tenders for Cement Walks

City of Sault Ste. Marie, Ontario

Sealed tenders fully endorsed and marked "Tender for Cement Walks," addressed to T. E. Simpson, Mayor, Sault Ste. Marie, Ont., will be received by the City Clerk up to seven o'clock p.m. on **Monday, June 2nd, 1913**, for the construction of about 116,000 square feet of cement concrete sidewalks.

Specifications and plans may be seen and all information and forms of tender obtained at the office of the City Engineer, Sault Ste. Marie, Ont.

A marked cheque for $1,400, payable to the order of the City Treasurer, must accompany each tender. A bond to the amount of $5,000, or in lieu thereof a cash deposit of $3,000, will be required of the successful bidder.

The lowest or any tender not necessarily accepted.

C. J. PIM, City Clerk.

W. W. VAN EVERY,
21-22 City Engineer.

To Contractors

Sealed tenders, marked "Tender for Work," addressed to the undersigned, will be received at this Department until noon on **Saturday, June 7th**, for Dining-Hall building to be erected on the grounds of the Ontario Agricultural College, Guelph.

Plans and specifications can be seen at the above institution and at this Department. An accepted bank cheque payable to the Honourable J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signatures and addresses of two sureties or the bond of a guarantee company approved by the Department, must accompany each tender.

The Department is not bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary.
Department of Public Works, Ontario,
Toronto, 23rd May, 1913.

Newspapers publishing this without authority will not be paid for it. 22

For Sale

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

For Sale

One No. 1 Marsh-Capron Rail-Track Concrete Mixer, with Trucks, Steam Engine and Boiler, elevating Side-Loader and automatic Measuring Tank. Capacity, 9 cu. ft. of mixed concrete.

This is a first-class machine and has never been used. Will be sold at a bargain as the owner does not now require it.

Apply to Box 801, Contract Record, Toronto, Ont. 23-26

For Sale

Tenders wanted for purchase in whole or in part of the following apparatus:—

1 Goldie McCullough Wheelock Engine, 125 h.p. 20 x 50 x 16 x 50.
1 Laurie Corliss Engine, 90 h.p., 13 x 30.
2 Northey condensers and pumps, 8 x 12 x 12.
36 ft. 4-in. line shafting, complete with vertical shaft hangers and boxes and 2 friction clutches.
2 belt tighteners.
1 pulley, 46 x 23½.
1 pulley, 30 x 22.
2 pulleys, 19½ x 17.
1 pulley, 17½ x 72.
1 pulley, 5 x 28.
79 ft. 2-ply, 17½-in. leather belt.
61 ft. 2-ply 16-in. leather belt.
82 ft. 19½-in. leather belt.

Approximately 100 ft. 4-in. steam pipe with valves and fittings complete.

All the above apparatus in first class shape but has been discarded owing to the introduction of Hydro Electric Power and may be seen at thePumping Station, St. Marys' Ontario.

H. M. MILLER,
Sec. W. L. & H. Commission.
19-22 St. Marys, Ont.

CONTRACTORS

Why don't you try this new firm for quick delivery of supplies. The International Supply & Construction Co., Ltd., Hull, Que. 21-24

Tenders for Debentures

Sealed tenders addressed to the undersigned will be received up to 7.30 o'clock p.m. on **Monday June 12, 1913,** for the sale of $20,000.00 Hydro-Electric Power Plant debentures of the Village of Elmira, Ont., bearing interest at 5 per cent., payable in 30 equal instalments for principle and interest.

No tender necessarily accepted.

J. H. Ruppel, Clerk.
Elmira, May 26, 1913. 22-23

Electric Motors For Sale

Following Canadian General direct current compound wound motors.

One only 15 H. P. 750 R. P. M.
One only 10 H. P. 800 R. P. M.
Two only 7½ H. P. 1,000 R. P. M.
One only 3 H. P. 1,200 R. P. M.

All nearly new. Sliding bases, automatic rheostats. Complete with pulleys and switches. Bargain for quick sale, apply, The Metallic Roofing Co. of Canada, Toronto. 22

BARGAINS!

All Steel Drag Line, Lidgerwood, Class B. with 1½ yd. and 1 yd. buckets, 60 ft. boom; A.1.	$3,200
No. 0 Thew Steam Shovel, used less than 90 days, shop No. 690, practically new.	3,300
30 1½ yd. end dump cars, 36 in. gauge, practically new, each	30
1 American Well Works Air Compressor, 12 x 12 x 14, 340 ft. capacity, new ...	440
1 Rand Belted Compressor, 10 x 14, A.1.	240
1 Austin No. 0 Trenching Machine, used 1½ years, thoroughly overhauled	2,700

THAT'S NOT ALL

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where "the breezy call of incense breathing morn" will put new life in mind and body. Muskoka offers more real healthful enjoyment for less money than any other resort in the world.

Four cottages to rent $125 to $200 on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box 771,

Contract Record, Toronto Ont.

Situations Vacant

WANTED—Manager, either practical builder or engineer, familiar with Concrete Construction houses and factories. Excellent position for the right party. Apply, giving references and experience, to Box 798, Contract Record, Toronto, Ont. 21-22

Wanted—Manager for a Western Construction Company who will take a financial interest in business. Must have thorough knowledge of building. The company has a small mill in connection with their present business. Present manager retiring. This is a good opening for the right man. Address all correspondence to Box 793, Contract Record, Toronto. 20-22

Unclassified Items

Greenwood, B.C.

Tenders received by R. C. Desrochers, Secretary, Dept. of Public Works, Ottawa, until June 16, for construction of public building. Plans, etc., at office of Wm. Henderson, Resident Architect, Victoria, B.C., post office at Greenwood and Dept. of Public Works, Ottawa. Cheque for 10 per cent. must accompany each tender.

Montreal, Que.

Tenders received by R. C. Desrochers, Secretary, Dept. of Public Works, until June 16, for construction of Postal Station "F," Plans, etc., at office of Mr. D. J. Spence, architect, 46 Beaver Hall Hill, Montreal, and this Department. Cheque for 10 per cent. of amount must accompany each tender.

Ottawa, Ont.

Tenders received by R. C. Desrochers, Secretary, Dept. of Public Works, until June 11 for addition and alterations to Rideau Hall. Plans, specifications, etc., at this Department. Cheque for 10 per cent., payable to Hon. Minister of Public Works, must accompany each tender.

Tenders received until June 4 for dredging at Cloud Bay, Whitby, Bruce Mines, Hilton, Killarney, Little Detroit, Walker River. Specifications, etc., from R. C. Desrochers, Secretary, Dept. of Public Works, to whom tenders must be addressed. Cheque for 5 per cent. must accompany each tender and in no case must cheque be for less than $1,500.

Building Permits

Toronto, Ont.

Recent permits include:

G. F. Hurlbut, 1 pair semi-detached, 2½-sty. brick store and dwellings, near Browning on W. S. Jackman, $5,500.

A. E. Moffat, two detached 2-sty. and attic brick dwellings and garage, at 50-[illegible] Oakmount Road.

J. Cleland, two pair semi-detached, 2½-sty. brick dwellings, near Hazel, on Fernwood ave.

Canadian Chewing Gum Co., [illegible] brick addition to factory, [illegible] cor. of Logan and [illegible], [illegible]

D. McDonald, 2½-sty. brick dwelling on N. S. Walmer Road, $7,500.

Miss McDonald, 2½-sty. brick dwelling, near St. Clair, on Wells Hill [illegible], $6,000.

A. & A. Grant, 1 pair semi-det. 2-sty. brick dwellings, near Ellerbeck, on Browning ave., [illegible]. Two pair semi-det. 2½-sty. brick dwellings, near Ellerbeck on Browning, $11,000. One pair semi-det. 2½-sty. brick dwellings, near Jackman on Browning, $5,500. Two pr. semi-det. 2½-sty. brick dwellings, near Ellerbeck on Browning, $11,000.

J. F. McKay, 2 pair semi-det. 2½-sty. brick dwellings, near Gerrard, on Prust ave., $9,600.

J. Tanner, 2-sty. and attic brick dwelling and a garage, near Alberta on S. S. Biggar, $6,500.

L. Legrow, 1 pair semi-det. 2-sty. brick stores and dwellings, near Crawford on Bloor, $10,000.

T. Nattress and J. McMillan, 1 pair semi-det. 2½-sty. brick dwellings, near Mallon on Bertmount, $5,000.

A. Greig, 2-sty. brick dwelling, near Heath, on E. S. Parkwood, $6,500.

W. A. Forester, 7 attached 2½-sty. brick dwellings near Carlton, on E. S. Homewood, $30,000.

Jas. Wood, 3 det. 2½-sty. brick dwellings, near Yonge, on N. S. Farnham, $10,000.

W. B. Reid, 1 pair semi-det. 2-sty. brick and roughcast dwellings, near Shuddell, on W. S. Jones ave., $6,600.

H. E. Bond & Co., 5-sty. brick addition to warehouse, near Wellington on Simcoe, $26,500.

T. G. Watson, 1 pair semi-det. and 1 det. 2-sty. brick dwelling, near Queen on E. S. Wilton, $6,500.

C. P. Godden, 2-sty. and attic brick dwelling, near Parkwood on Montclair, $6,000.

D. H. Atkinson, 2-sty. and attic brick dwelling on 41 Rosehill ave., $6,500.

P. G. Might, two det. 2½-sty. brick dwellings, naer Cuthbert Cres., on Belsize Drive, $7,000.

Sharp Construction Co., 3 det. 2-sty. brick dwellings, near Manor Road on Carey, $9,500.

T. Wright, 2½-sty. brick dwelling, near Algonquin on E. S. Indian Road, $7,000.

A. Nelson, 3 att. 2-sty. brick dwellings, 711-713-715 Gladstone ave., $9,000.

A. Nelson, one pair semi-det. 2-sty. brick dwellings, 707-709 Gladstone ave., $6,200.

Herbert Begg, 2-sty. brick dwelling, near Duplex, on S. S. Alexandra Blvd., $7,500.

Fox & Co., 3-sty. brick factory on Charlotte & King, $30,000.

H. S. Beckwith, 2½-sty. brick dwelling near Keele on High Park Gardens, $7,500.

H. Winnett, 2-sty. and attic brick dw., N. E. cor. Warren and Lonsdale, $25,000.

New Companies

The Sault Ste. Marie Land Company, Limited, has been incorporated with a capital of $50,000, to carry on business as a general land and building company, with head office at Sault Ste. Marie. The provisional directors are J. A. McPhail, barrister, T. T. Barnes, druggist, and Dr. G. W. Bald, all of Sault Ste. Marie.

The Toronto-Berlin Land Company, Limited, has been incorporated with a capital of $40,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are R. B. Haley, broker, R. T. Irvine, and G. W. Eversfield, salesman, of Toronto.

Gloucester Realty Company, Limited, has been incorporated with a capital of $50,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are J. H. T. Nesbett, J. J. Flint, bookkeepers and G. D. Waters, cashier, all of Toronto.

Volt Electric Company, Limited, has been incorporated, with a capital of $40,000, to manufacture and deal in electrical appliances and devices, etc., with head office at Toronto. The provisional directors are D. F. Pierce manager, J. J. Kenney, sales manager, and J. E. Anderson, law student, all of Toronto.

J. Muldoon, Limited, incorporated with a capital of $50,000, to carry on business as a general builders supply company, with head office at Toronto. The provisional directors are J. C. West, accountant, Jas. Muldoon, merchant, and T. H. Terry, foreman, of Toronto.

S. A. Keers Limited, incorporated with a capital of $40,000, to erect buildings and deal in building material, with head office at Toronto. The provisional directors are S. A. Keers, J. C. Gray, and Thos. McCandlis, real estate agents, all of Toronto.

Napanee Brick and Tile Company, Limited, has been incorporated, with a capital of $100,000, to manufacture and deal in all kinds of builders' supplies, with head office at Napanee. The provisional directors are E. M. Young, barrister, of Picton, and Clarence Sands Madill, broker, of Montreal.

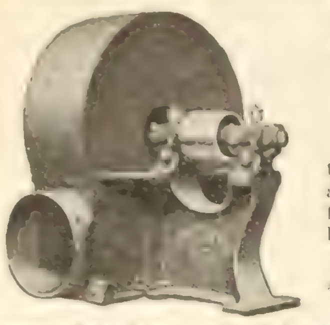
Mountville, Limited, incorporated with a capital of $40,000, to carry on business as a general land and building company, with head office at Hamilton, the provisional directors are F. W. Reinke, manager, T. M. Chambers, real estate agent, and J. E. Peart, gentleman, all of Hamilton.

Williamson Construction Company, Limited, has been incorporated with a capital of $100,000, to carry on business as general contractors and dealers in builders supplies, with head office at Walkerville. The provisional directors are Victor Williamson, contractor, C. V. Williamson, architect, and C. K. Hall, millman, all of Walkerville.

A. D. Shoup Company, Limited, has been incorporated with a capital of $40,000, to carry on business as a general construction company, manufacturers and dealers in wood, wood-pulp, paper, etc., with head office at Toronto. The provisional directors are J. S. Lovell, accountant, Wm. Bain, bookkeeper, and Robt. Gowans, solicitor's clerk, all of Toronto.

Charles Mould Company, Limited, has been incorporated, with a capital of $100,000, to manufacture and sell bricks, tiles pipes, cement, artificial stone, etc., with head office at Toronto. The provisional directors are Chas. Mould, builder, C. E. H. Freeman, and Thos. Moss, barrister, all of Toronto.

Chambers Limited have been incorporated with a capital of $40,000, to carry on business as consulting engineers, with head office at Toronto. The provincial directors are G. H. Sedgewick, G. E. McCann and A. G. Ross, solicitors, all of Toronto.



Sturtevant
(REG U S PAT OFF)

Stock Fans

Embrace such a diversity of types and sizes that nearly any ordinary conditions of fan engineering may be met by a fan shipped from stock.

Spare parts always ready for immediate Shipment.

STURTEVANT Engineers suggest and recommend apparatus to meet requirements.

ASK THEM 863

B. F. STURTEVANT, Hyde Park, Boston, Mass.

[illegible] Iron Works Ltd., Toronto. Eadie-Douglas Ltd., Montreal

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WINDOW LETTERS

House Numbers and numbers suitable for Hotels, Apartment Houses, Church Pews, etc.

Brass Plates, Enamelled Iron, Glass and Wood Signs

J. E. Richardson & Co.

Dep't. C. **147 Church St.**
Phone Main 7363 **Toronto, Ont.**

Aluminum & Crown Stopper Bldg., Toronto, Ont.
8266 pounds of CERESIT used on this building.

One Leaky Job Will Damage a Contractor's Reputation and Lose Him Other Jobs

No cement contractor can afford to take chances with cheap waterproofing in his concrete and cement plaster work. No contractor will experiment with his customers' buildings by using any waterproofing if he doubts the quality. The saving of a few cents on waterproofing is a dangerous way to economize. Get the best and be sure.

The leading Engineers in Europe and America recognize in

"Ceresit" Waterproofing

the most effective water resistant. These men have used it on tunnels, dams, reservoirs, swimming pools, sewers, foundations, bridges, aqueducts, viaducts, water towers, water tanks, cellars, floors, roofs, etc., etc.

No water pressure that **Ceresit** is required to withstand will affect its permanent water repelling properties.

Please write for Free Book "S" and try **Ceresit** waterproofing on your next job. **Ceresit** is used in all civilized countries. **Ceresit** is catalogued in Sweet's Index.

AGENTS WANTED IN UNOCCUPIED TERRITORY

CERESIT WATERPROOFING CO.

Commercial Bank Bldg., CHICAGO.

CANADIAN BRANCHES
Douglas Milligan, Ltd., 304 University Street, Montreal.
W. K. McDonald Co. Crown Office Bldg., Toronto.
Grose & Walker Ltd., 259 Stanley St., Winnipeg.
E. G. Cullen, 418 Pacific Bldg., Vancouver, B. C.
Carritte-Paterson Co., Ltd., St. John, N.B.
Carritte-Paterson, Ltd., Halifax, N. S.

Ceresit Factories are located in Chicago, Unna, Westphalia, Germany, London, Paris, Vienna, St. Petersburg.

Please cut this out

REMINDER

to write for Free Book "S" on how to Effectively and Permanently Waterproof Concrete and Cement Mortar.
CERESIT WATERPROOFING CO., Commercial Bank Building, CHICAGO

Gravity System Distributing Concrete

Gravity System Equipment on Large Concrete Building

A system that improves the concrete and reduces the cost.

Information gladly furnished and estimates given on any work.

Canadian Concrete Appliance Co., Ltd.

Sole Licencees for Canada

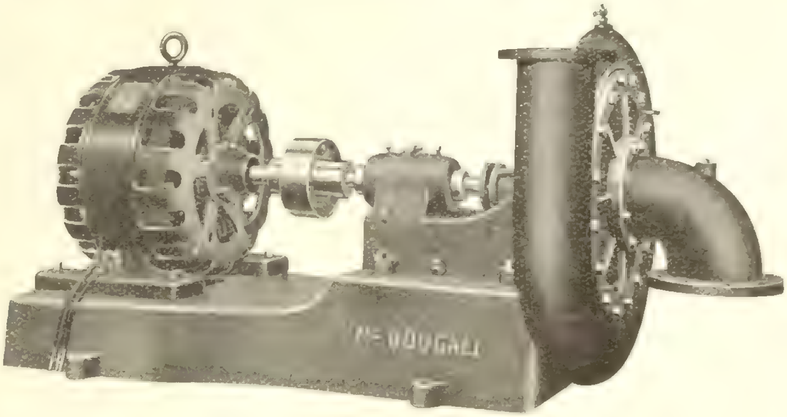
613 Vancouver Block,
VANCOUVER
B. C.

Eastern Representatives
Stinson Reeb Builders' Supply Co., Ltd.
Montreal, P. Q.

CENTRIFUGAL PUMPS

Designed and built to suit conditions of operation

Water Works
Fire Service
Condenser Service
Boiler Feed and
General Purposes



THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

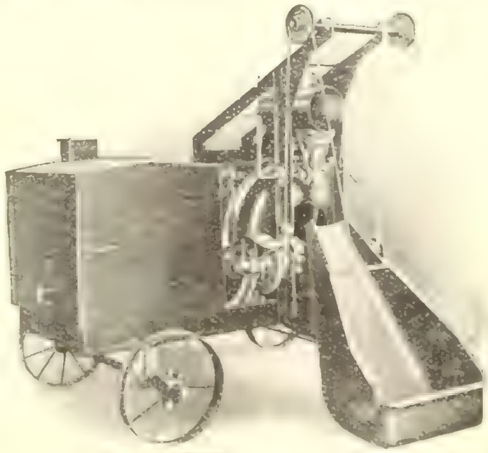
Works: Seigneurs & William Sts., MONTREAL.
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

On All Classes of Work KOEHRING MIXERS are mixing their way to popularity because of the Dollar Saving Qualities

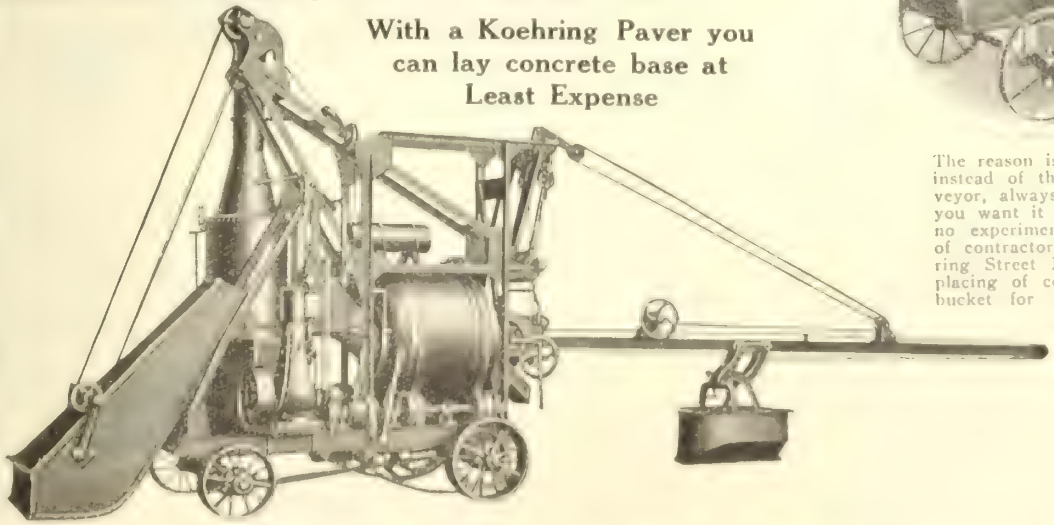
The Koehring 3 in 1 principle of mixing means three times as much mixing or an equal amount of mixing in one-third of the time. There are three independent and opposed mixing actions in the Koehring drum producing thoroughness of mixing and rapidity of mixing and a uniformity of mixing, no other Mixer equals. There are also equally important advantages in the mechanical construction of the Koehring Mixer.

The heavy cast special metal Koehring drum will outlast the drum of any other Mixer. The railroad truck bearing truss and the rollers being keyed on to the axle, makes "wabbly" drums impossible.

The charging bucket raises to a nearly vertical position so that all the material will pass into the drum without pounding the bucket. There are numerous other important features in the Koehring Mixer that you should know about.



With a Koehring Paver you can lay concrete base at Least Expense



The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds con- [illegible]

KOEHRING MACHINE CO., Milwaukee, Wis. Exclusive Sales Agent for Canada: Canada Foundry Co., Limited
Toronto Montreal Halifax Ottawa Cobalt Winnipeg Calgary Vancouver Nelson

A Real Bargain

40	Cast Iron Tees	12″ x 12″ to 3″ x 2″	at 2c. lb.
5	" " Y's	8″ x 8″ to 4″ x 4″	
10	" " Crosses	12″ x 12″ to 4″ x 2″	
21	" " Reducers	12″ x 10″ to 3″ x 2″	
30	" " Increasers	6″ x 8″ to 2″ x 4″	
70	" " Bends	12″ to 3″	
30	" " Plugs	10″ to 3	
70	" " Caps	10″ to 14″	
20	" " Sleeves	12″ to 6″	

57 C. I. Lamphole Covers and Frames at $2.50 each.

28 C. I. Manhole Covers and Frames at $6.00 each.

150	C. I. Ext. Valve Boxes for	4″ Valves	at $2.00
120	" " " "	6″ "	" 2.50
50	" " " "	8″ "	" 3.00
20	" " " "	12″ "	" 3.50

1	I. B. Brass M'td Gate Valve	6″	at 80% list
4	" " " " "	8″	
4	" " " " "	10″	
3	" " " " "	12″	

SEND FOR ITEMIZED LIST AND BLUE PRINTS

L. H. Gaudry & Co.

Limited
76 St Peter Street, QUEBEC

The Largest Mixer Order

for a single construction job

Ever placed in the Greater Northwest

Oregon Firm Buys

EIGHT AUSTIN IMPROVED CUBE MIXERS

Significant! Especially as the report which contains these facts goes on to add:

"This concern, preliminary to starting this work, took up an investigation of the various types of concrete mixers now on the market."

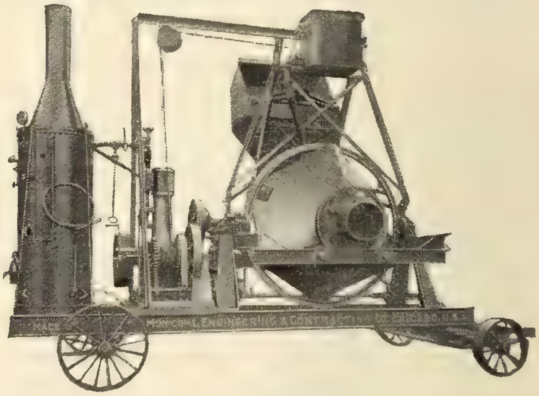
"*Investigated all the concrete mixers and then selected AUSTIN IMPROVED CUBES*"—remember that. It is the same thing that happened in the selection of the mixers to be used in building the Panama Canal—the same thing that is happening right along with greater and greater frequency.

These 8 AUSTIN IMPROVED CUBE MIXERS are going to be used to reline the old Wapatox Canal between Naches City and North Yakima, Washington; also to build two power plants. The work will require, all told, about 175 cars of cement and will cost close to three quarters of a million dollars.

Why, do you suppose, is the AUSTIN IMPROVED CUBE notably the *big-job* mixer?

Because men who have *big jobs* inevitably investigate the various mixers before buying, most carefully, and careful investigation invariably leads to the selection of the AUSTIN IMPROVED CUBE.

Start YOUR investigation NOW—it will pay.



Write for Catalogue No. 8

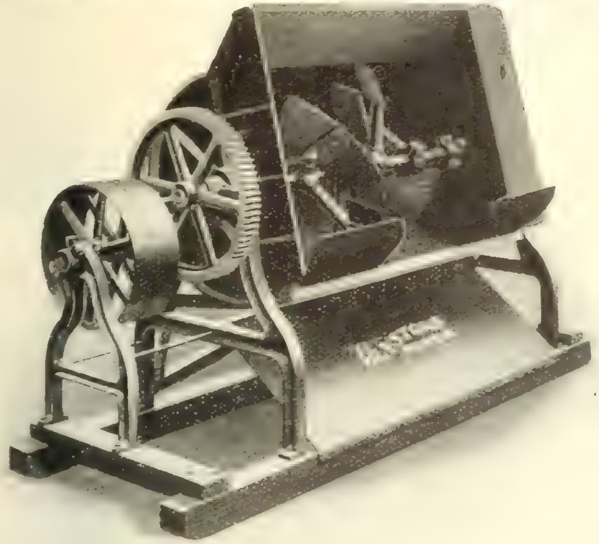
Municipal Engineering & Contracting Co.

Main Office: Railway Exchange Bldg., Chicago, U. S. A.
Eastern Office: 90 West Street, New York City, U. S. A.

Represented in Eastern Canada by
LECKY & COLLIS, Ltd., 335a Craig St. West,
Montreal, Que., and Napanee, Ont.

Represented in Western Canada by the
CANADIAN EQUIPMENT & SUPPLY CO., Calgary
E. G. CULLEN, Vancouver
Agents wanted in open territory

The Best Service at Lowest Cost



The Blystone Skid Mixer

The perfect design and construction of this mixer reduces the working cost to a minimum and effects the greatest ease in operation. All working parts are strongly made and will not get out of order.

Easy to work—Easy to Clean High efficiency—Low cost

SEND FOR PARTICULARS

The Blystone Machinery Company
63 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
Contractors Department No. 1, TORONTO, CAN.
Sole Distributors for Canada

Have You Investigated Our

STEEL ROOFING FOR FLAT ROOFS?

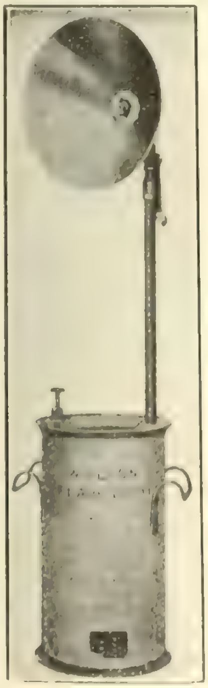
It is an easily laid roofing and makes a durable, fireproof and weatherproof job.

We want every Contractor and Builder to have a sample of this "Flat" Roofing, also our Illustrated Catalogue. Sent free on request.

Corrugated Iron Metallic Shingles
Metallic Sidings Metallic Ceilings
Etc., Etc.

The Metallic Roofing Co. LIMITED
Manufacturers
TORONTO, ONT. WINNIPEG, MAN.

Contractors' Acetylene Flare Lights



Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by
International Marine Signal Co. Limited
Ottawa, Canada

FOR SALE

1—10 x 16 Standard Gauge Porter Locomotive
1—12 x 15 Waterous Slide Valve Engine
1—6 1-2 x 8 American D.C. D.D. Hoist with Swinger
1—7 x 10 Lambert D.D. Hoist
1—10 x 12 Beatty D.C. D.D. Hoist with Swinger
1 5—Ton Tandem Roller
1 20 H.P. Waterous Portable Boiler
1 30 H.P. Locomotive Boiler on Skids
5 Rock Drills
1— No. 2 Smith Concrete Mixer
1 No. 2 Milwaukee Concrete Mixer
1 15 H.P. Upright Boiler

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
340 Sparks Street, Ottawa, Ont.

Jennings & Ross, Limited

Engineers and Contractors
TORONTO

Royal Bank Building, King and Spadina

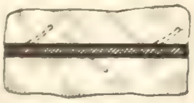
Phone Ade. 282

Showing progress of building 250 ft. x 300 ft. for

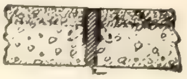
Rolph & Clark, Limited

Send for This Book on Concrete Pavements

Our booklet on concrete pavements illustrates and describes pavements in many different cities, giving cost data and describing in detail the methods used. Complete specifications for the ideal concrete pavements are included as well as instructions for installing Baker plates. This booklet is sent without charge to responsible engineers contractors and highway officials.



Longitudinal Section Showing Joint.



Cross-Section of Pavement Showing Expansion Joint.

Baker Armor Plates

Protect Your Concrete Pavement at its Weakest Point—the Expansion Joint

Wayne County's 70 Miles of Concrete Roads Prove that the Baker Plate Has Solved the Expansion Joint Problem.

"The only surface repair required on our concrete roads has been on the roads first constructed, where the joints were not protected with the 'armor' plates."

Extract from Sixth Annual Report of the Board of Country Road Commissioners, of Wayne County, Mich., Sept. 30th, 1912.

Our new system of installing Baker Armor Plates is simplicity itself, and holds the joint to perfect line and grade.

We guarantee Baker Armor Plates to be perfectly crowned as specified, and entirely free from defects of manufacture.

R. D. BAKER CO., 73 Home Bank Bldg.
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Hamilton Pressed Brick

Mallory & Thatcher, Architects.

These fine new apartments in Toronto are being built of the popular Hamilton Red Pressed Brick

Popular, because its deep uniform red shade is always the same and never fades.

1,000,000 bricks are on hand in our yards ready for immediate shipment.

Hamilton Pressed Brick is made from shale, rich in ironoxide and free from so called soda.

It has been used in many of the leading public buildings, schools and residences throughout Canada.

Send us your next rush order.

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Limited

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Factory	**1992**
Office	**2931**
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Toronto Representative, WALTER HUNTER, 105 MACDONELL AVE. Telephone Park 3170

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We build all kinds of Cranes for

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Complete Outfits for
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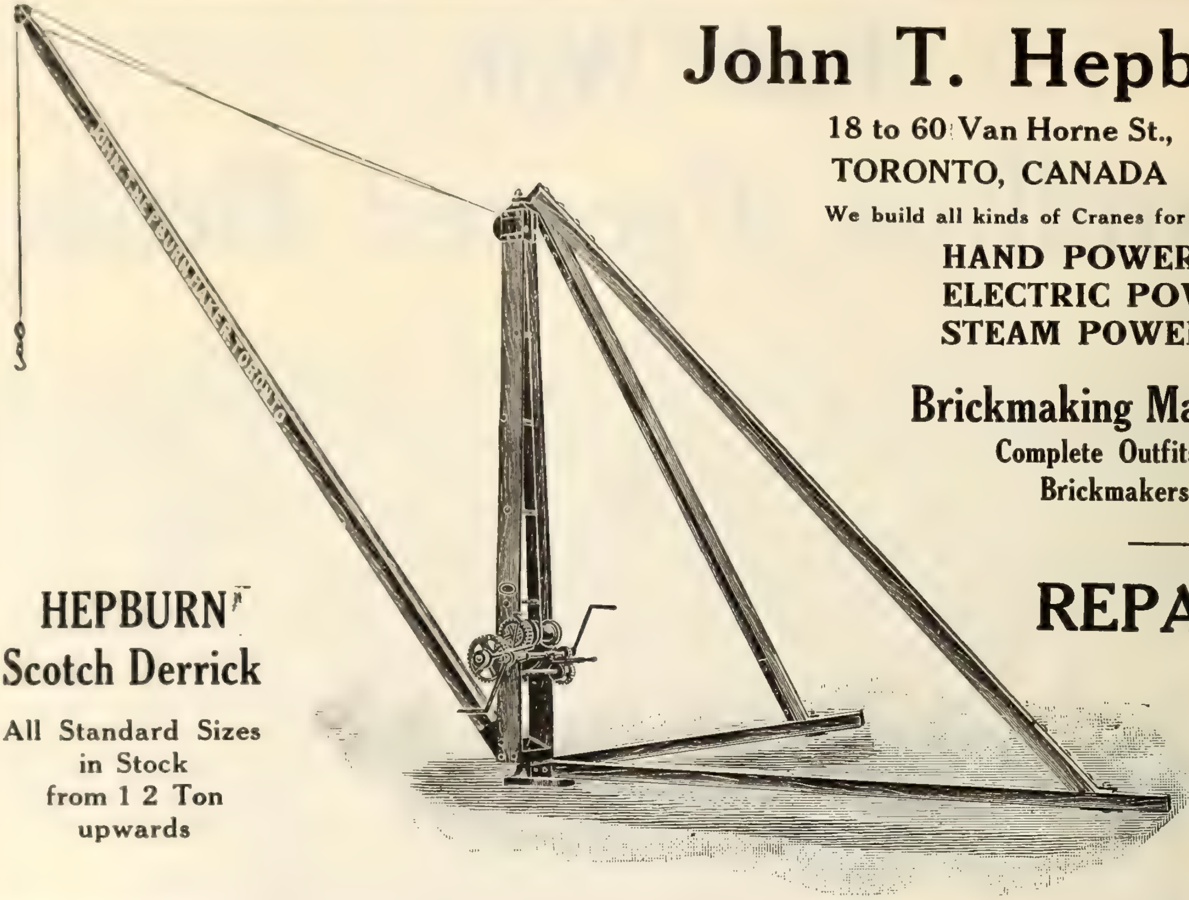
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HEPBURN'S Scotch Derrick

All Standard Sizes
in Stock
from 1 2 Ton
upwards

Wooden Water Pipe

Galvanized Wire Wound and Continuous Stave Pipe
for Water Works, Power, Irrigation, etc.

Withstands 250 lb. working pressure.

Not affected by Frost, Corrosion, Electricity or Acid. Water Works Systems installed. Prompt attention to inquiries.

Write for prices.

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The Reliable Line of

VALVES

- Brass Globe and Gate.
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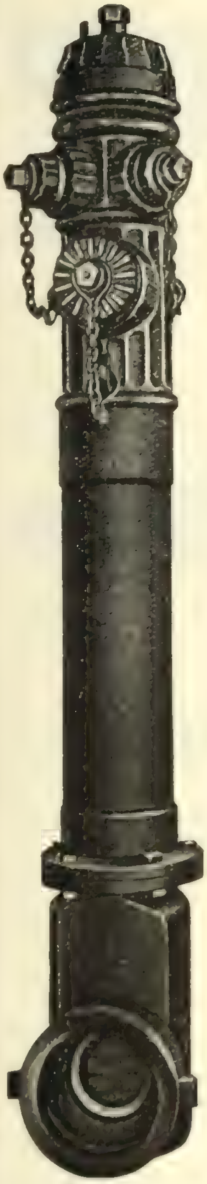

Kerr Gate Hydrant.

Gate and Compression FIRE HYDRANTS

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CRANES FOR FILLING WATER CARTS

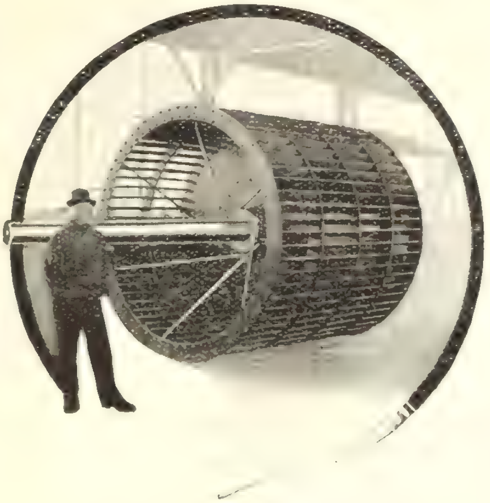
VALVE BOXES
Screw Adjustable or Slide Adjustable

Forty Years of Experience has much to do with the satisfaction these goods give our customers.

6" Hub End Gate

THE KERR ENGINE CO.

LIMITED
WALKERVILLE, ONT.



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TRADE MARK.

Ventilating Fan

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A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

Let us tender on your next requirements. Bulletin No. 3401 is descriptive of the construction and operation of "Sirocco" Fans. You should have a copy.

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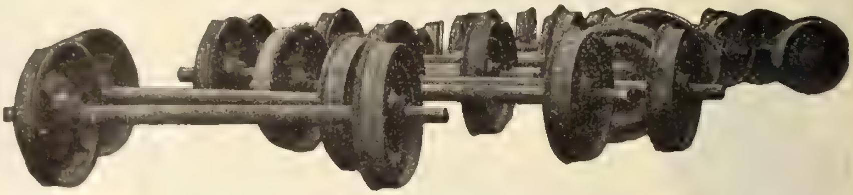

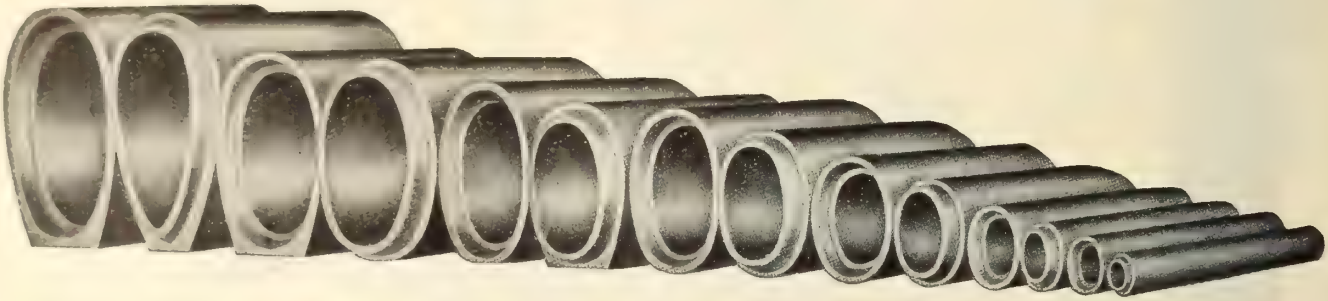

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properly built of properly made

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OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. **Stock sizes 6 in. to 60 in.**

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

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Kemptville, Ontario

EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

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Here's Exactly Why Engineers Recommend

Scherzer ROLLING Lift Bridges

"Used All Over The World"

Designed on the Universal Rolling Principle

200 Scherzer Rolling Lift Bridges now in successful use in the

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Some Reasons Why The Scherzer Rolling Lift Bridges Are Recommended by Engineers the World Over—

It is a riveted complete rigid structure.

Truss has no pin connections.

Very little machinery in structure—about 5 per cent. of total metal. (Machinery costs about three times as much per lb. as structural steel.)

Over 50 per cent. less MACHINERY than a design with trunnions.

So perfectly balanced as to require little power to operate.

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Raised and lowered without shock.

Less metal than other designs.

Gives maximum clearance of waterway without fender piles.

Machinery or truss not exposed to damage by boat lurching to side.

Concentrated loading at any point not as great as on a trunnion.

Counterweight is fixed. Height of counterweight not much over ordinary truss.

No high towers.

All parts easy of access.

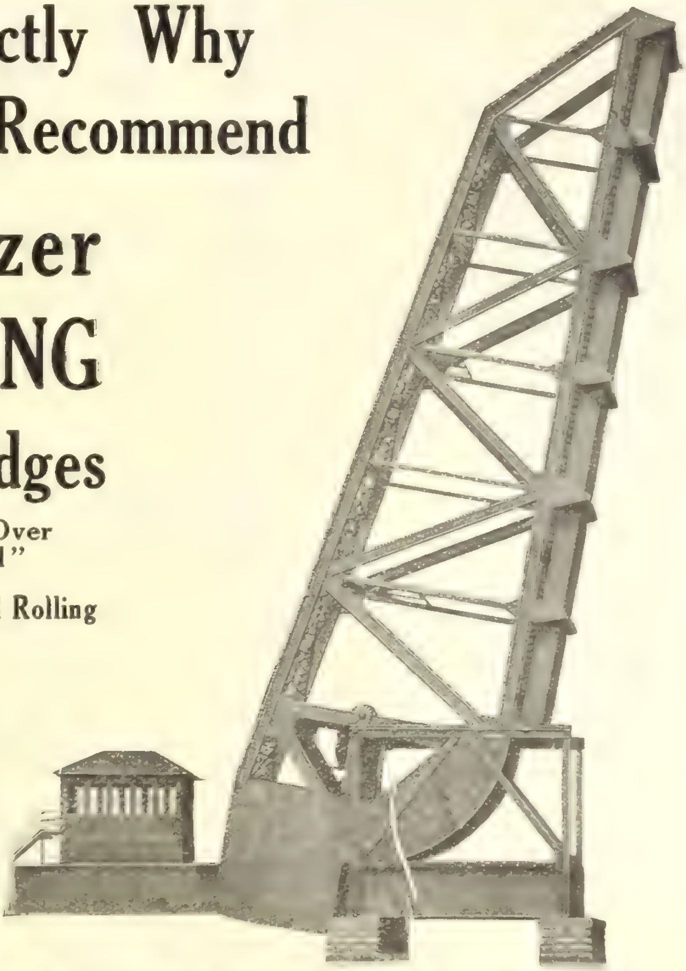
No costly trunnions or heavy castings liable to be displaced.

No uplift to overcome before bridge commences to rise.

Requires shorter piers than a trunnion.

Trusses roll in direct line of standard distance c. to c. of ordinary trusses.

Grade of railway or bridge could be raised in a simple manner.



Notice the simple, rigid, riveted one-piece movable bridge. Extraordinary simplicity and rigidity—greatest efficiency at ess cost

Scherzer ROLLING Lift Bridges cost less to install, operate and maintain—because they are simple, rigid, riveted structures with less metal than any other movable bridge and far less machinery. They are balanced in all positions, minimizing motor power. Their base is rounded just enough to let them roll forward and down, closing them; or roll back and up, opening them. This forward and back motion saves large amounts in material, weight and motive power, as a much shorter span can be used. When open, the bridge is back, away from the channel, preventing accidents from moving boats.

No friction-causing axles, journals or trunnions are used to carry the bridge. There is nothing to lubricate but the small motor and very simple machinery. The curved base rolls on level tracks, using the simple principle of track and wheel used by all railroads. The foundations naturally cost less because the bridge weighs less. No wharfage is needed on either side. New bridges can be added beside the old ones, avoiding wasteful replacement.

A Scherzer ROLLING Lift Bridge can be opened or closed in thirty seconds, a vast saving in time for land and water traffic. Tracks are fastened permanently to the bridge, doing away with rail lifts or end lifts and preventing accidents. When open, these bridges are barriers against accidents and signal distant traffic to stop.

The Foundations Cost Less Because the Superstructure Is So Simple and Weighs Less

Send for sketches, estimates and full information, showing how Scherzer ROLLING Lift Bridges are adapted for the widest channels, with particulars of demonstrated efficiency and economy.

Scherzer
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Main office Monadnock Block Chicago, U.S.A.

Eastern Office
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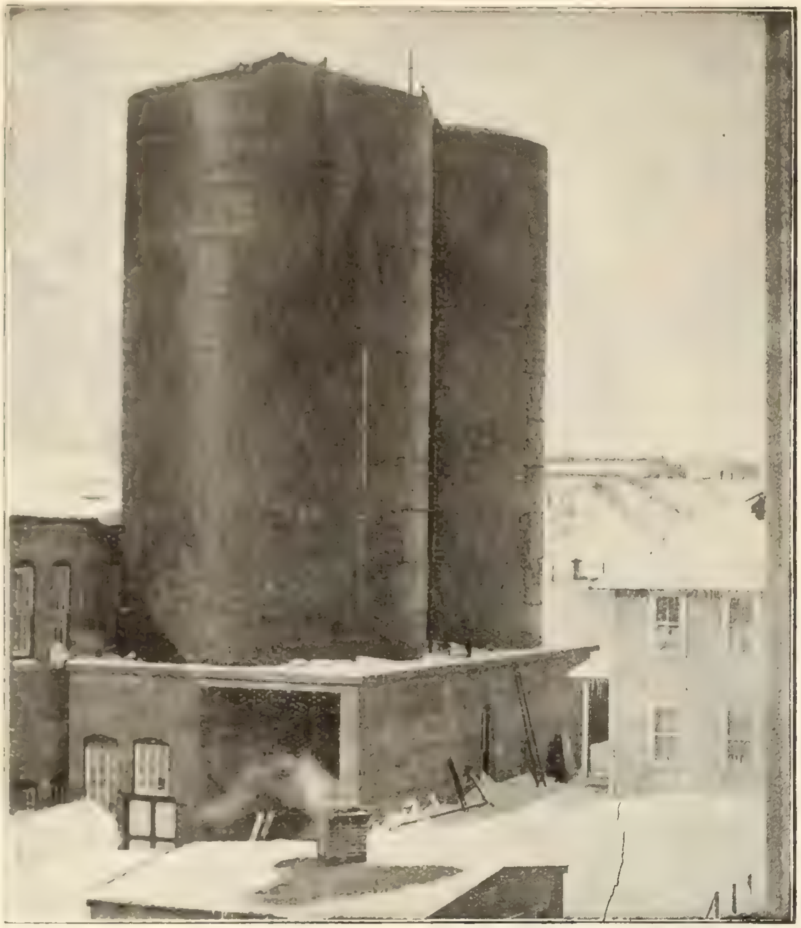
Cable Address
Scherzer Chicago



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Designed,
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We GUARANTEE
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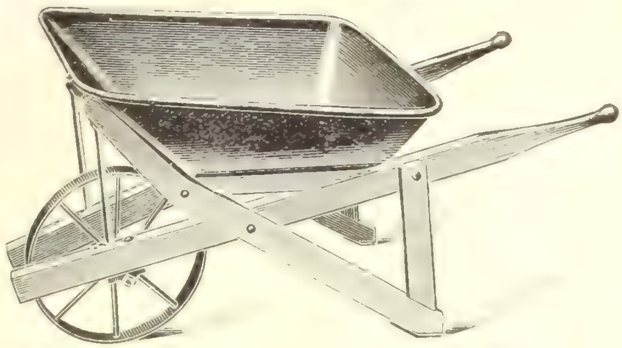
IRON AGE



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As makers of the high grade "Iron Age" products we solicit your trade in the following lines:—

DRAG AND WHEEL SCRAPERS—
Each Drag Scraper is pressed from a solid sheet of high-carbon steel—no joints or seams. Our Wheel Scrapers have all the latest dumping attachments and are supplied with either pressed or square bowl. All "Iron Age" Scrapers are of standard capacity.

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The trays are pressed from a solid sheet of high-carbon steel and the edges are turned over. Fitted with heavy steel wheels, hardwood frames, long handles, in fact the whole construction is thoroughly substantial.

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Nothing to break, bend, or get out of repair. Ten horses can be used without straining the parts.

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Why don't YOU do this?

PAID FOR ITSELF IN ONE MONTH

Peterson, Iowa, Jan. [illegible] 191[illegible]

I first saw one of your LITTLE WONDER'S working at Everly, Iowa and it looked so good to me that I bought a machine at once.

My LITTLE WONDER "FIVE" paid for itself in just one month. I have worked around several different mixers and the LITTLE WONDER "FIVE" has them all beaten.

W. J. JOHNSON, Contractor and Builder.

You can make more money with this Concrete Mixer than with many of larger capacity and greater cost. [illegible] yet does hard work.

LITTLE WONDER "FIVE"

"The Small Job Money-Maker"

Pat. [illegible]

TEN DAYS' FREE TRIAL

and our "Man to Man" proposition [illegible] known in mixers for small work. Hundreds of contractors in the States are doubling their profits with it; why not you?

If you want a machine for heavy work look into our WONDER "TEN" capacity [illegible] Sold under the same FREE TRIAL and liberal terms.

Send for our "Man to Man" proposition NOW, while you are thinking about it.

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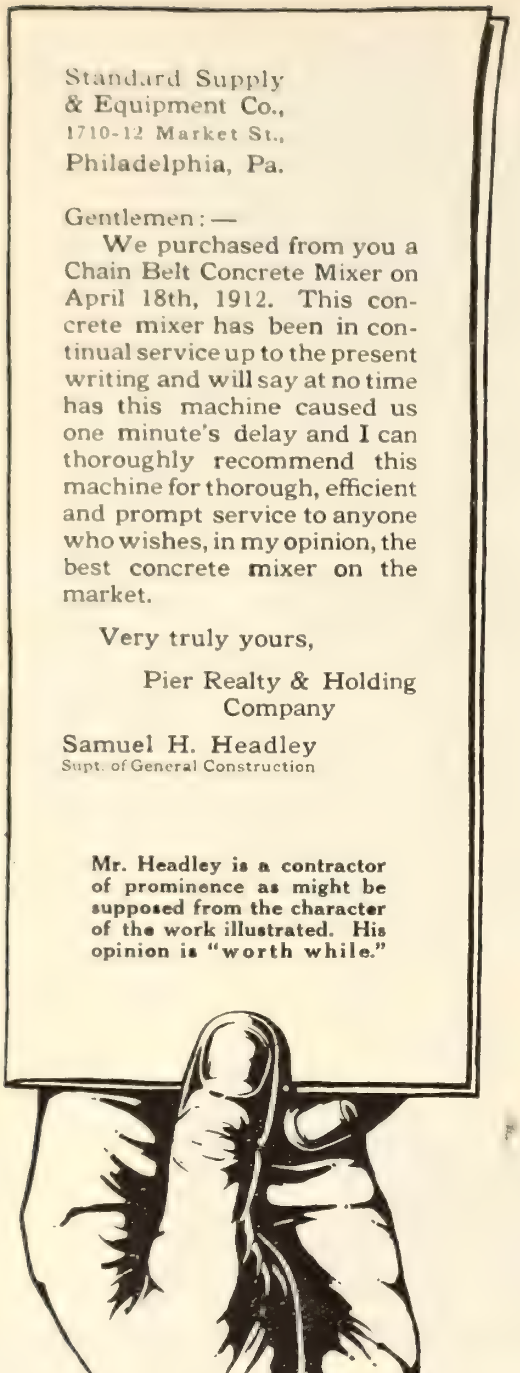
WATERLOO CEMENT MACH'Y CORP'N
117 Vinton St., WATERLOO, IOWA



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We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

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Samuel H. Headley
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Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

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"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

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There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

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Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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Sole owners of the B. M. patent process of lumber preserving.

British Method **Best Method**

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Water, Salt, Oil and Gas Wells drilled to any depth up to 5,000 feet, any diameter.
Tests made for foundations. Contracts taken in any part of Canada. Excellent references.—Estimates furnished.

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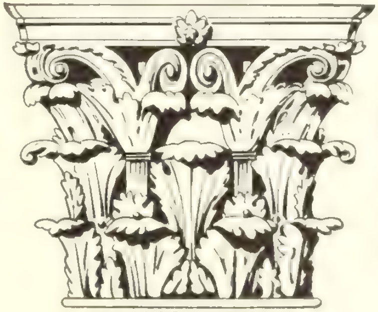

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Has tested at Toronto Faculty of Science, over 4000 lbs. per square inch Crushing Strength.

Any size, shape or quantity. Send for prices to

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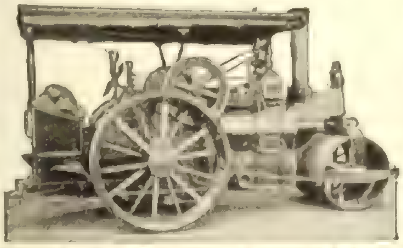

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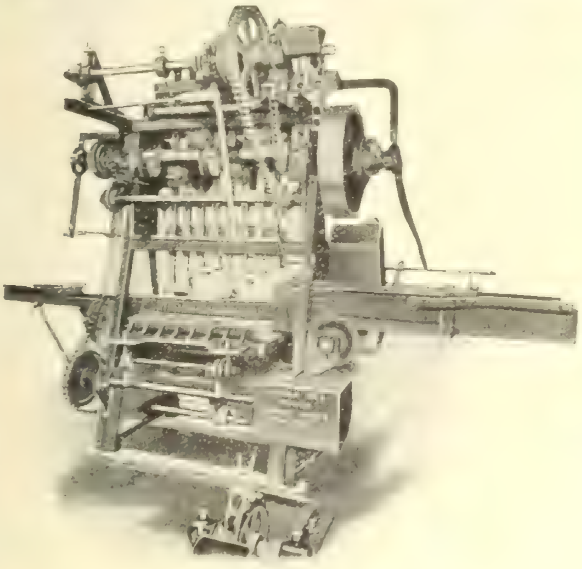
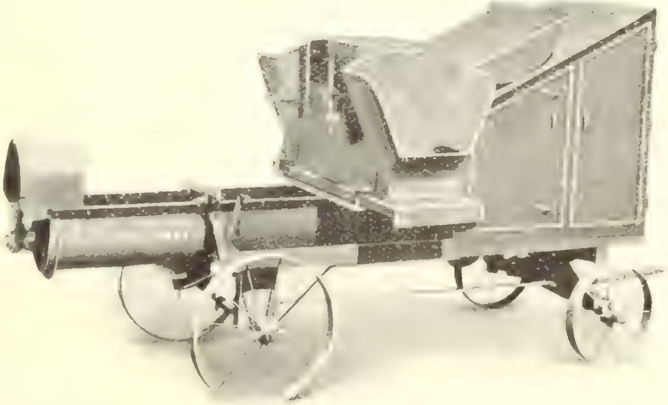


Besser Power Cement Brick Machine



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STONE of any Size and in any Quantity on hand for Sidewalks, Roadwork or Concrete Work

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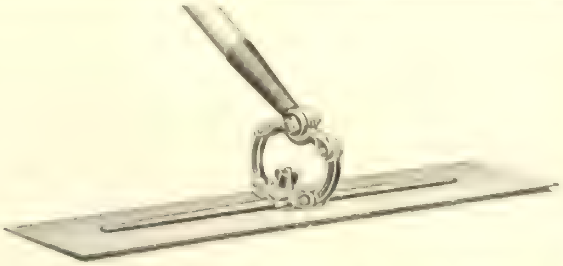
Head Office:
47 Yonge St. Arcade, TORONTO
G. W. ESSERY, Manager



"Abram" Sidewalk Finishing Tools are sold on the Guarantee that **ONE MAN** can do more work with them than **THREE MEN** can do with ordinary tools. This means if finishers get [illegible] per day you save the wages of **TWO MEN** [illegible] by using "Abram" tools. We positively guarantee this result. Let us prove it to you — Circular.

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and all sizes of Drain Tile and Cement Brick.
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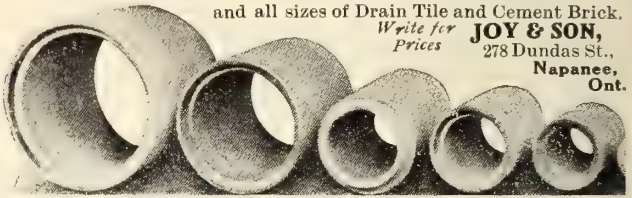

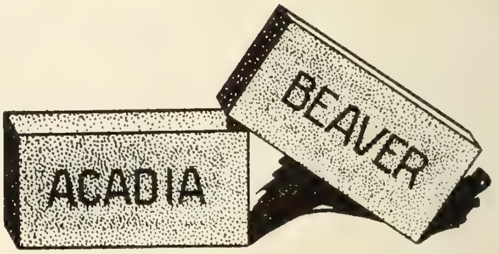

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"Acadia" or "Beaver"

To specify just "Pressed brick" is a mistake. Insist upon getting a product of known merit. Specify **Acadia** and **Beaver** brands of pressed bricks. They are uniform in size, quality and appearance.

May we send you particulars and prices?

PROMPT SHIPMENTS ALWAYS.

Nova Scotia Clay Works, Ltd.
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GLASS BENDERS TO THE TRADE

THE TORONTO PLATE GLASS IMPORTING COMPANY, LIMITED

Plate, Window, Figured, Stained, Wired, Bent, Mirror and Ornamental Glass

DON ROADWAY TORONTO

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which account for the superiority of

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Its Durability; Does not crumble or pulverize under the densest traffic; second only to granite blocks.

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Its Noiselessness; The rattle and bang of vehicles passing over its smooth surface absorbed and muffled till the quiet of the dirt road is obtained.

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We manufacture blocks of the highest possible standard, the very best materials only being used and in the DOMINION WOOD BLOCKS we believe we produce an article that has no equal.

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Company, Limited
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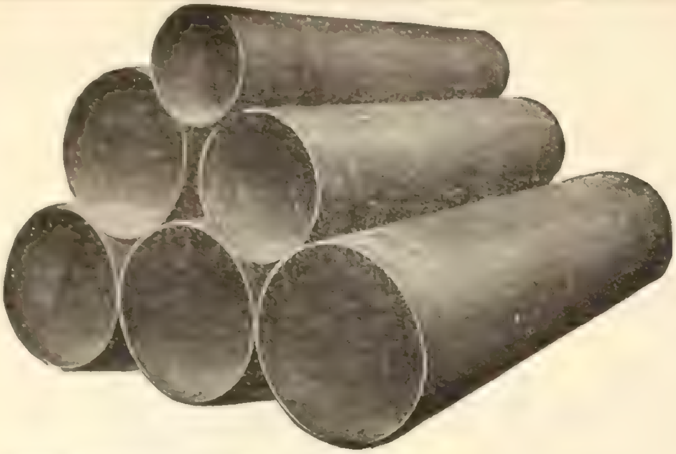

Lap Welded Steel Pipe

We carry in stock
30 INCH DIAMETER
LAP WELDED STEEL PIPE

Ask for Prices

International Marine Signal Co.
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Ottawa, Canada

The
Missisquoi Marble Company
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Canada's Pioneer and Leading Concern in the Marble Business

They will sell you Quarry Blocks, Sawn Marble, Marble completely finished for either interior or exterior purposes, and, if necessary, they will contract to set it in place.

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A. K. Mills & Son - -	Ottawa, Ont.
James Robertson Co. Ltd. -	St. John, N. B.
G. R. Duncan - -	Fort William, Ont.
Walker & Barnes - -	Edmonton, Alta.
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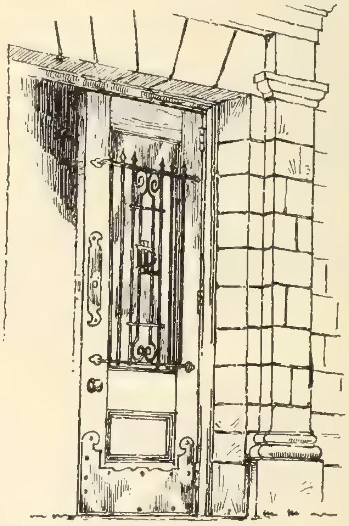

Wrought Iron Door Grills

Kick Plates
Push Plates

We make all sorts of work in wrought iron, brass and bronze, for the protection and decoration of the exterior and interior of buildings.

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London, Ont.
Toronto Branch : 36 LOMBARD STREET

THE DOMINION WOOD PIPE COMPANY
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NEW WESTMINSTER, B.C.
MANUFACTURERS OF
DOUBLE WIRE WOUND

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CAST IRON SPECIALS, VALVES, HYDRANTS, ETC.

Nashawena Cotton Mill, New Bedford, Mass. All interior lining of "American" Enameled Brick.
Write for miniature or full size samples.

AMERICAN ENAMELLED BRICK & TILE CO.
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- ¶ Standard sizes of Hoisting Engines shipped from stock.
- ¶ Six sizes of Clamshells on hand.
- ¶ Quick shipment on any type of Excavating or Material Handling equipment for use on land or water.
- ¶ "Beatty Plant" on your work means continuous service and complete satisfaction.
- ¶ Let us give you the benefit of our Fifty Years of Experience in Building Contractors Machinery.

Full information gladly sent you. Write now.

M. Beatty & Sons, Limited

Welland, Ontario

More and Better Mortar with Renfrew Lime.

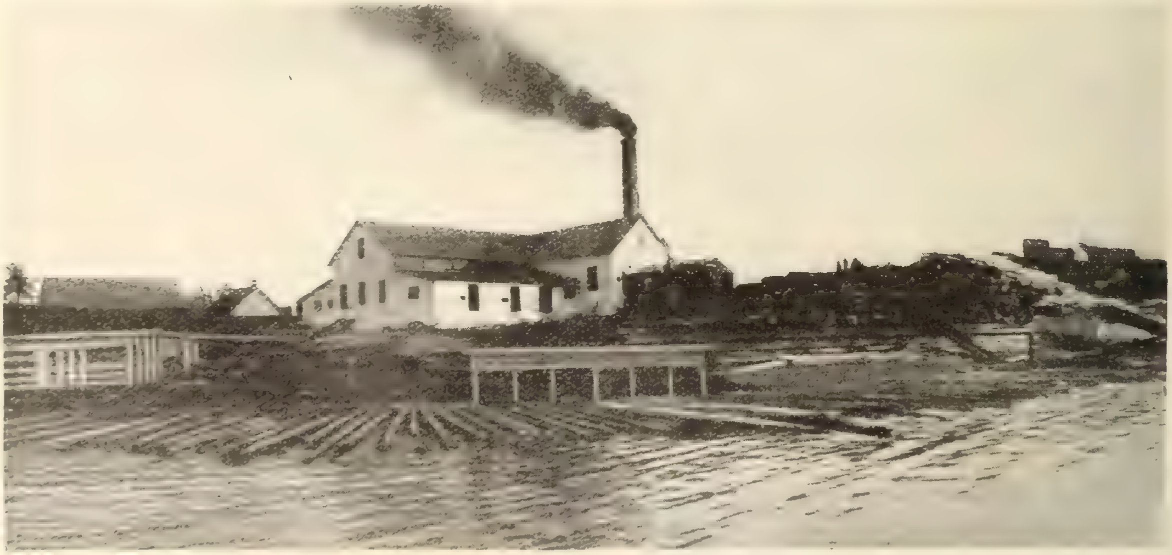
The brick-layers who use "Renfrew" lime for their mortar claim that it makes more mortar per 100 pounds of lime than any other brand on the market. And when it sets it is like a rock ensuring a permanent and clean-cut job. It is very easy to work with, thus saving time, trouble and money.

You will always find "Renfrew" lime to be the same good quality—it has been the same for 25 years.

White Lime - Gray Lime
Stone - Drain Tile - Brick

JAMIESON LIME CO.

Renfrew, Ontario



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Heavy yellow pine and fir timbers on hand.

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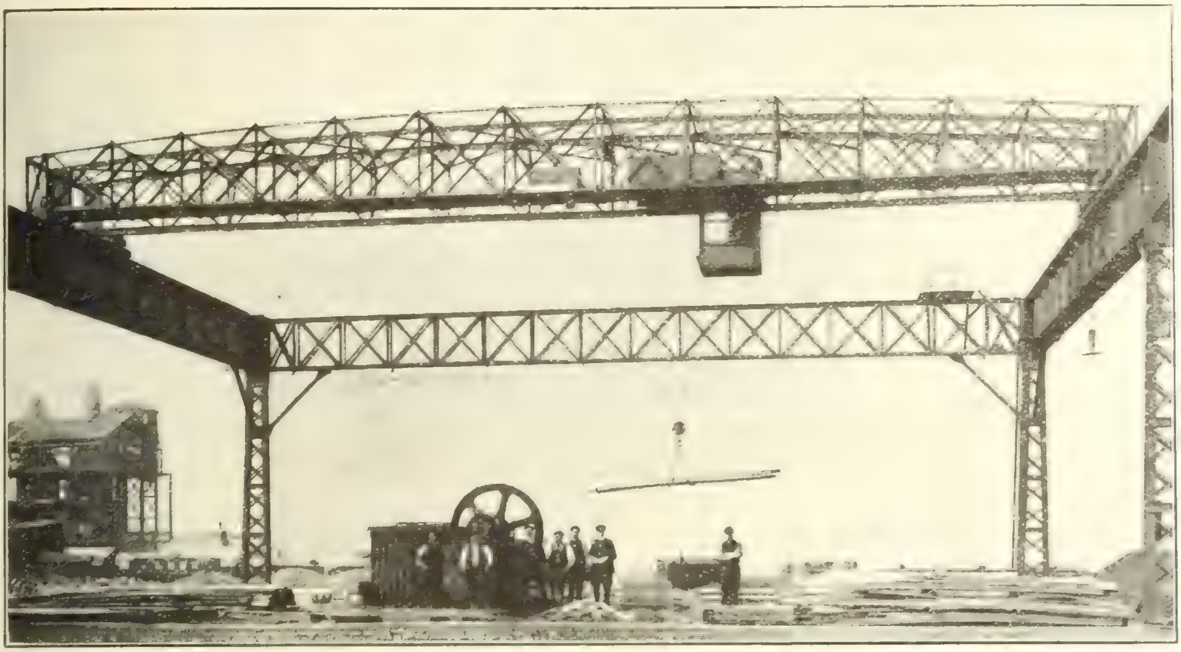

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Royce

Electrical
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Include
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Motors,
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YOUR ENQUIRIES ARE SOLICITED FOR

CRANES TELFERS CAPSTANS WINCHES

ROYCE, LTD., Trafford Park, Manchester, England

Brownhoist Locomotive Crane With Drag-Line Bucket

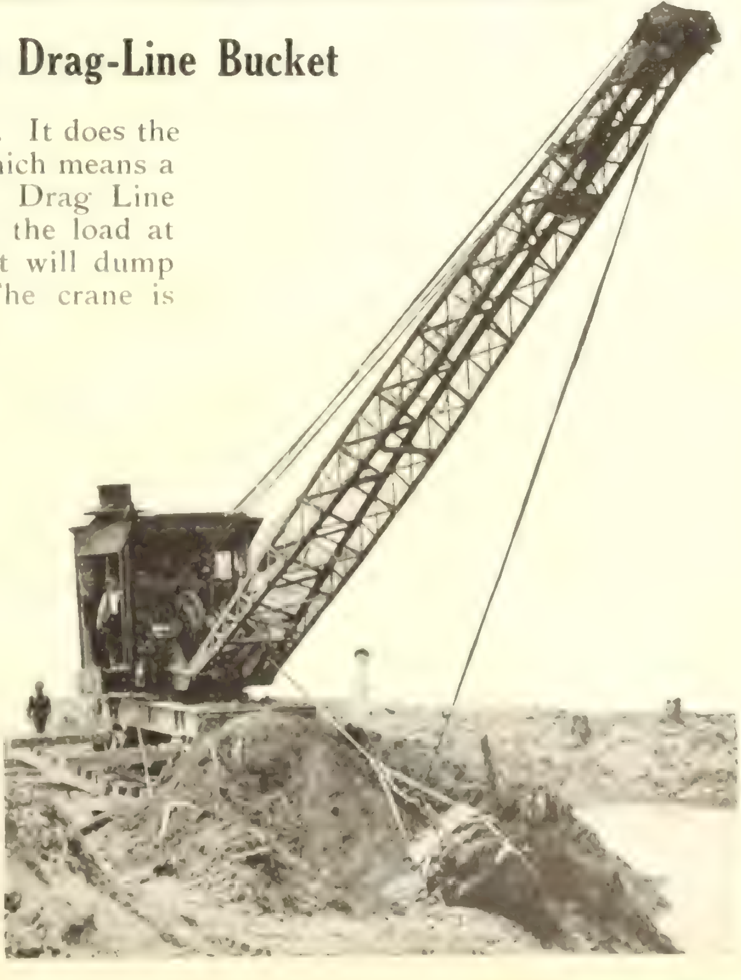
is being used today on large excavating jobs. It does the work rapidly and with only a few men—which means a low cost per yard. With the Brownhoist Drag Line Bucket the operator of the crane can dump the load at any point along the boom—or the bucket will dump automatically at the end of the boom. The crane is shown here on the New York Barge Canal.

The Brownhoist Crane and Bucket are built for a severe service and continuous operation

Records show where the crane has been used day and night for months at a time without stopping for repairs. This appeals to contractors because loss of time is expensive.

We furnish this equipment up to 100 ft. booms and 3½ yd. bucket.

Write for detail information



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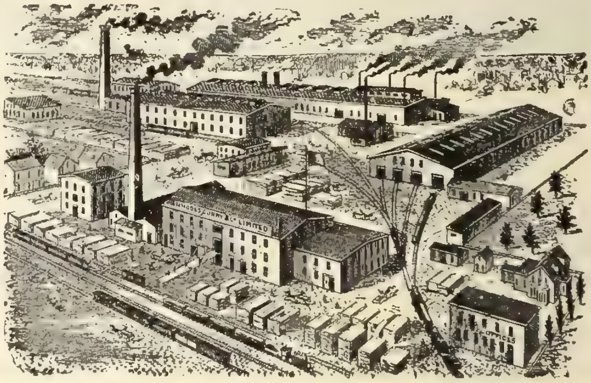

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SCHOOL DESKS A SPECIALTY

We manufacture all kinds of building materials, including cast iron columns, cresting, sash weights, etc.

In addition to our large stock of native lumber, we are now carrying about one million feet of foreign lumber, including oak, walnut, ebony, whitewood, basswood, red cedar, Douglas fir, mahogany, &c.

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KAHN SYSTEM
OF REINFORCED CONCRETE

Steel Sash
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Concrete Finishes
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Reinforced Concrete

Trussed Concrete Steel Co. of Canada, Limited
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Branches everywhere

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Portland Cement, Lafarge Cement, Gravel, Sand, Rubble, Imported and Canadian Pressed Brick for front work and fireplaces.
CRUSHED STONE—Dimension and Coursing Stone, Lime
FIRE BRICK IVORY CEMENT PLASTER

—YARDS—
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is our specialty, We fabricate and erect from your drawings, or will design your structure for you.

No Work Too Large for us to handle in the minimum of time. May we estimate on your requirements?

WALSH PLATE & STRUCTURAL WORKS, LIMITED

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Block, Sawed, Planed
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Made by practical Jack Builders. Material best grades of malleable iron and steel. Fully guaranteed as to durability and efficiency. The long even stroke of the lever together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

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Stock carried by F. H. Hopkins & Company, Montreal

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of all designs in both iron and steel; Roofs, Telephone Poles, House Girders and all kinds of Structural Iron Work.

Our stock in hand comprises Steel Beams, Angles, Tees, Channels, Plates, Rolled Edged Flats, Bars, Rivets, Rounds, &c.; Iron Beams, Bars, Squares, Turnbuckles, Rivets, &c.

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Steel Buildings
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Railway and Highway Bridges

Locomotive Turn Tables and Structural Steel and Iron Work of all descriptions. Estimates furnished on application.

Stand Pipes and Water Towers for Corporations a Specialty

Expert Builders of

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of all descriptions

Storage and Pressure Tanks of various capacities carried in stock.

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The Toronto Iron Works, Limited
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McGregor & McIntyre
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Toronto, Canada

OUR NEW WORKS: NORTH SHAW STREET
Main Structural Shop: 130 ft. x 400 ft.
Area of Grounds: Ten Acres
Capacity: 18,000 Tons Annually

We build and erect all kinds of Structural Steel Work Roof Trusses, Bank and Office Railings, Stair Work, Elevator Grilles, Fire Escapes, etc.

Over 5,000 Tons in Stock of
Beams, Column Sections, Angles, Tees, Plates, Bars, Checkered Floor Plates, etc.

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Designers, Fabricators and Erectors of Structural Steelwork for Bridges and Buildings of every description.

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5000 tons of Beams, Channels, Angles, Plates, Flats and Bars always in stock at our works for **quick delivery,** plain or fabricated.

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Manufacturers of the well-known

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Frost-Proof

Water

Meters

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Main Office - 90 West Street

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The Des Moines Hemispherical Bottom Steel Tanks and Towers

have been used and approved by nearly all leading Engineers. They are undoubtedly the most economical means of storing water at an elevation.

We have built many of these in Canada the United States and Mexico.

Estimates cheerfully furnished.

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Steel Construction Co.

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Manufacturers and Erectors of

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If you are intending to purchase **Steelwork** for any purpose, it will be to **your interest** to permit us to quote.

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WE ARE MANUFACTURERS OF

Structural Steel of All Kinds

Railway and Highway Bridges
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Beams, Channels, Angles, Plates, etc., in stock

ESTIMATES AND DESIGNS FURNISHED ON APPLICATION

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WATER WORKS CONTRACTORS

MANUFACTURERS OF

WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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802 McGILL BUILDING, MONTREAL

Works: ALEXANDRIA, ONT.

Wm. P. McNeil & Co.

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STEEL MERCHANTS

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MANUFACTURERS AND CONTRACTORS FOR

Steel Railway and Highway Bridges, Steel Frame and Mill Buildings, Structural Steel and Plate Work of any description.

Capacity 9000 tons per annum.

Shop is equipped with High Speed Electric Cranes and Modern Heavy Duty Tools, Can handle single pieces structural work of 40 tons.

Large Stock of Beams, Channels, Angles, Tees, Plates, etc., for prompt shipment.

Stock yard runway 800-ft. long, crane 70-ft. span.

Shipping runway 400-feet long, crane 80-ft. span.

Delivery yard runway 120-teet long, cranes 40-ft. span.

Orders and Inquiries Solicited

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Spadina Avenue Dock
TORONTO

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Water Washed Sand
Pit Sand
Screened Gravel
Pit Run
Crushed Limestone
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OUR plants at AYR and TORONTO are the most modern in the country and our materials are the best that can be produced.

Call Adel. 1947 and we will be pleased to give you all information regarding prices and deliveries.

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THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.

LIMITED

Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

HAMILTON, ONT.

The Canada Iron Corporation, Limited

Head Office:
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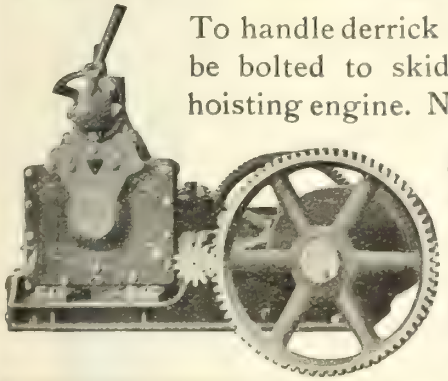
Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear



To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.

Start, Stop, Reverse at Will

Write For Catalogue CR.

Dake Engine Co.
Grand Haven, Mich.

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"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
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The Ready Mixed
Hard Wall Plaster

Manufactured by

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100 Bleury Street - - MONTREAL

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for Interior Construction

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LARGEST MANUFACTURERS IN CANADA OF

any size for Water, Gas, Culvert or Sewer

Lake or Rail Shipments
Offices, Works and Docks, TORONTO

NOTICE TO OUR CUSTOMERS

¶ Please take note that from 1st of May next our mills and Head office will be located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

Lyster Wood Box Turning Enamelling Company, Limited
LYSTER

Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.

BUILDERS SUPPLIES

- Lime
- Portland Cement
- White Cement
- Keenes Cement
- Plaster Paris
- Hard Wall Plaster
- Mortar Colors
- Fire Brick
- Sewer Pipe
- Weeping Tile
- Sacketts Plaster Board
- Parkers Corner Bead
- Rubble Stone
- Crushed Stone, Etc.

With our 9 Branch yards situated as they are we are prepared to guarantee a prompt delivery service of any orders you may favor us with and would ask you to give us a trial in order that we might prove same to you and also prove the excellence of our material.

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Limited
Crown Office Building, Toronto, Ont.
Head Office Phones: Main 5472—5473

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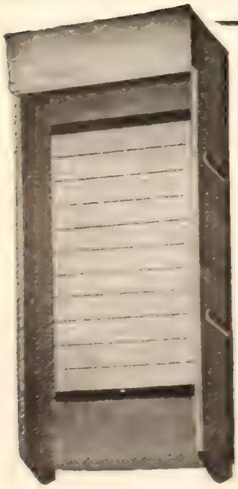
SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.



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SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

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COMBUSTION ENGINEERS
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GAS PLANTS FOR INDUSTRIAL PURPOSES BLUE WATER GAS
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Representing the Lumbering and Woodworking interests of
British Columbia Alberta Saskatchewan and Manitoba

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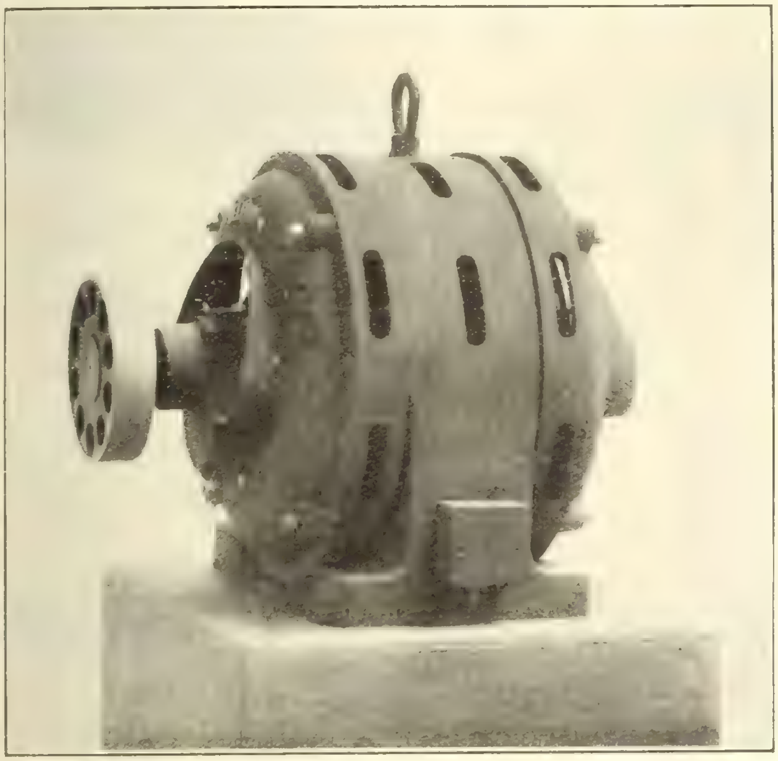

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All kinds of
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Builders under the patents of
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ESTABLISHED 1826

Automatic Elevators
Passenger and Freight

Simplicity Foolproof High Efficiency
Patent Single Phase Motor High Starting Torque

RAIL BRICK

A Filler Brick —completely filling the web of the rail—doing away with any other kind of filler—and so planned that neither settlement nor vibration of rails causes brick to get out of place—made in different sizes.

A Stretcher Brick laid along side the filler brick completing the groove for car wheel flanges and giving the advantage of grooved rails.

One hundred and ninety two miles of these brick sold last year

The Nelsonville Brick Company
NELSONVILLE, OHIO

Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking ...	24 00	28 00
No. 2 Hemlock, [illegible] and 1 in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide [illegible]	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
[illegible] x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 [illegible] pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

[illegible]

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

		Star	D.D.
10 to 25	united inches	$4 25	$ 6 25
26 to 40	"	4 60	6 75
41 to 50	"	5 10	7 50
51 to 60	"	5 35	8 50
61 to 70	"	5 75	9 75
71 to 80	"	6 25	11 00
81 to 85	"	7 00	12 50
86 to 90	"		15 00
91 to 95	"		17 50
96 to 100	"		20 50
101 to 105	"		24 00
[illegible]	"		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 in.	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71 80		9 00
81 85		10 00
86 90		11 00
91 95		13 00
96 100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock	net $1.85
No. 4½ Fuller's	net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 15 per cent.; lead waste, $9.00, less 15 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 40 per cent.; pig lead, 5c lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

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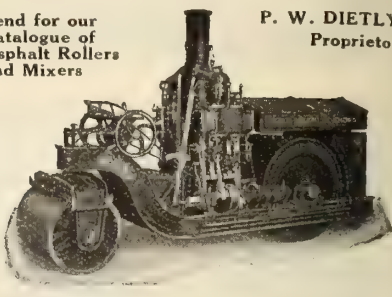

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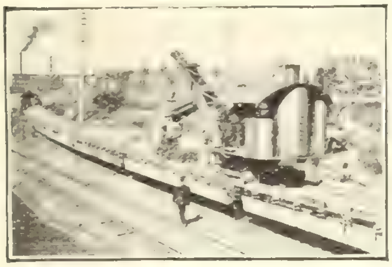

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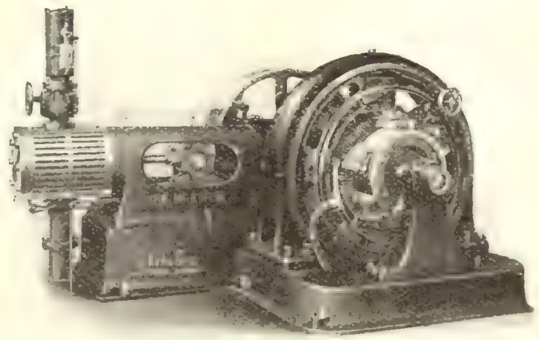

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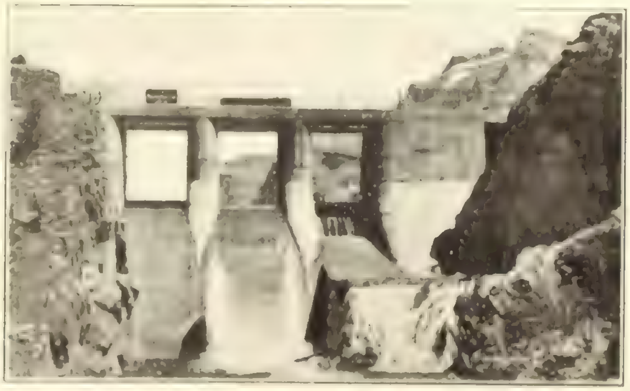

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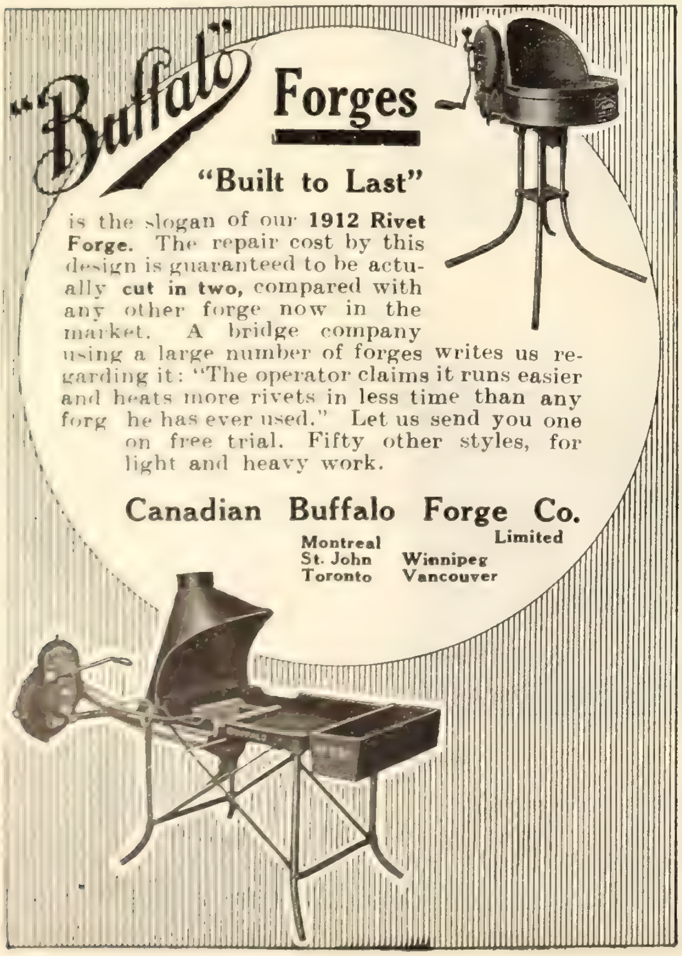

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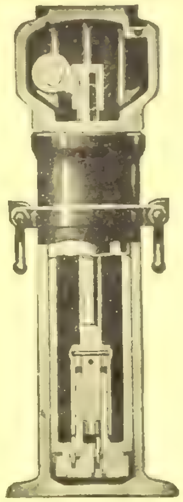

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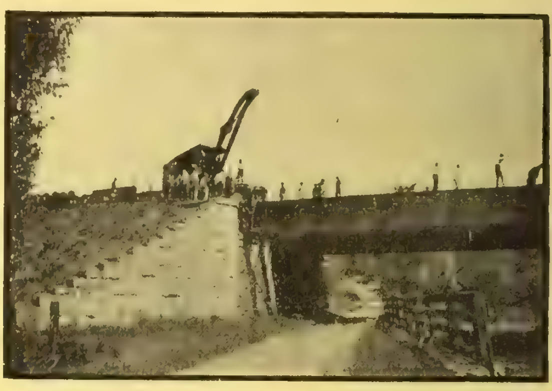

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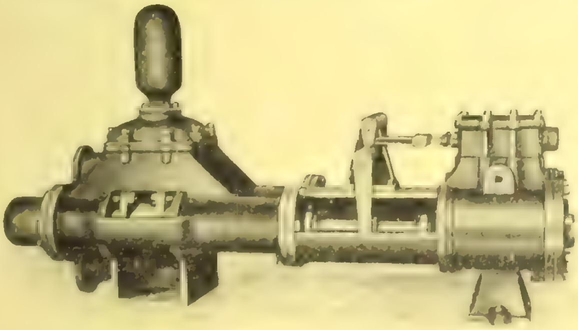

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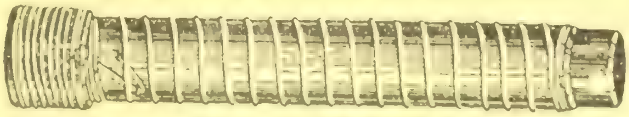

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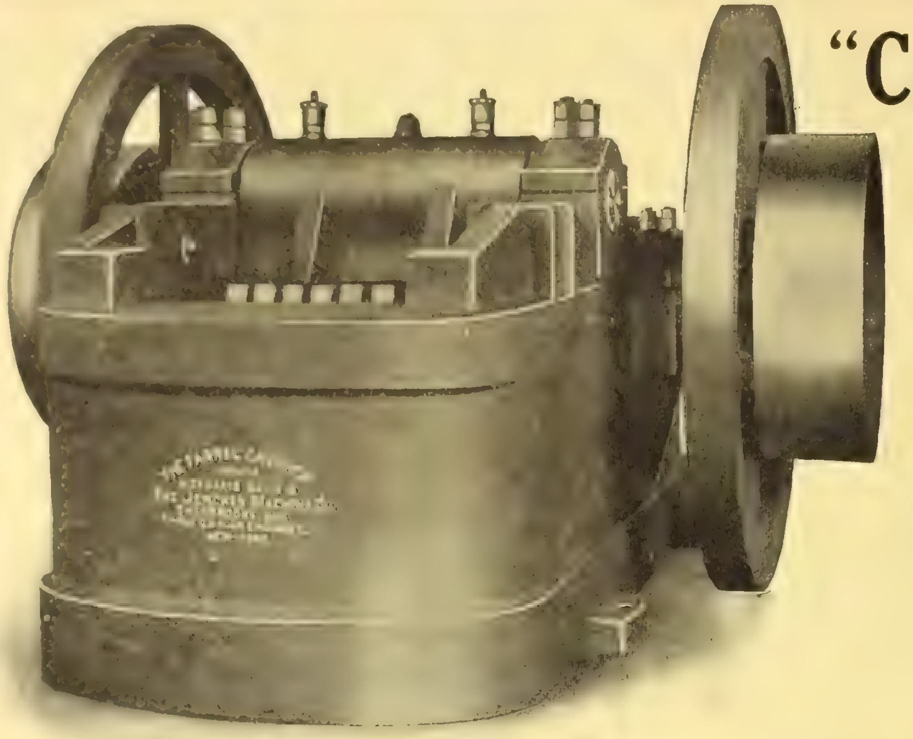

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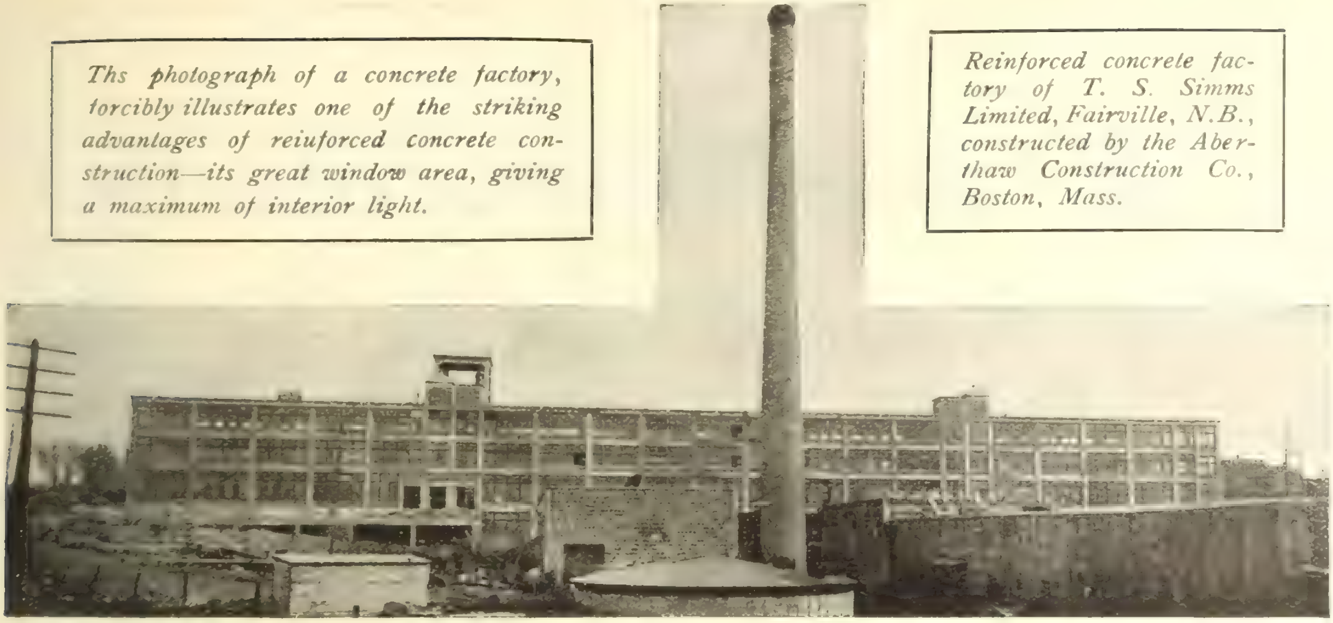

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In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

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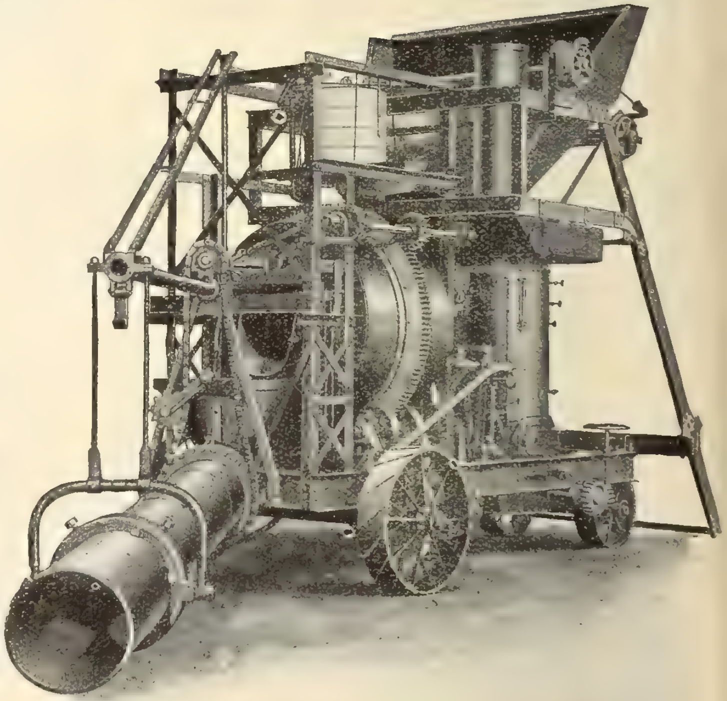

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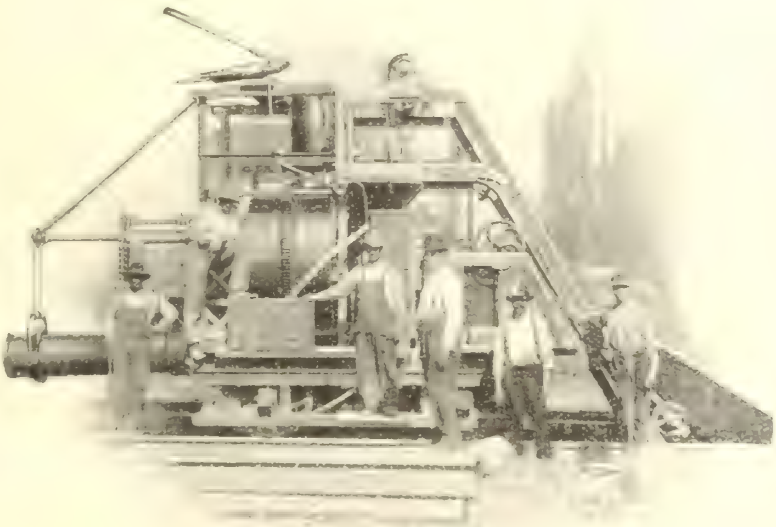

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Lecky & Collis
London Concrete Machinery Co.
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Wettlaufer Bros.

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Browning Engineering Co.

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Canadian Buffalo Forge Co.
Canada Foundry Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.
Star Expansion Bolt Co.

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Drill Steel Sharpeners
Canadian Ingersoll-Rand Co.

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Western Wheeled Scraper Co.

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Canadian Buffalo Forge Co.
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Smyth & Ryan.

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Improved Equipment Co.

Gas Machinery
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Escher Wyss & Co.

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Canadian Fairbanks-Morse Co.
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Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F.

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Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

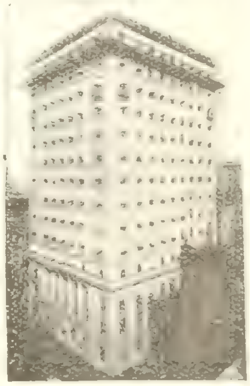
Don Valley Clay Products

For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Lumsden Building, Toronto
J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.
Don Valley Fireproofing, Bricks and Tile used throughout.



Traders Bank, Toronto
Carrere & Hastings and F. S. Baker, Associate Architects.
Don Valley Porous Terra Cotta Fireproofing and 2,000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

Royal Bank, Toronto
Eustace G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.
Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Bell Telephone Building
[illegible]
[illegible]
[illegible] and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

"Steelcrete" Concrete Reinforcement

MAXIMUM EFFICIENCY AT MINIMUM COST

Bridge at Campbellford, Ont. "Steelcrete" Floor Reinforcement

One of the more than two hundred highway bridges throughout Canada with Steelcrete Expanded Metal Reinforcing for the floor slabs.

Slabs of concrete reinforced with "Steelcrete" Expanded Metal make a permanent bridge floor of the greatest strength, at the least cost, and with the least amount of superimposed dead load on the bridge. "Steelcrete" possesses an absolutely mechanical bond against vibration. It lies flat. Once placed, disarrangement is impossible. The meshes are diamond shaped, the joints absolutely rigid. There are no corrugated or twisted strands. When the load is applied there is no straightening out to split the concrete before the reinforcement comes into tension.

Specify "Steelcrete" for

Floors, Roofs, Domes,
Tanks, Dams, Piers,
Sidewalks,
Foundations,
Warehouses,
Power Plants

Made in Canada:—Two Factories in Toronto, one in St. Catharines, Ont.

STEEL & RADIATION, LIMITED

TORONTO
Head Office—Fraser Ave.

MONTREAL
138 Craig Street West

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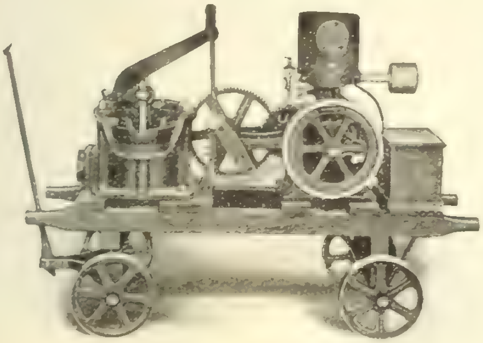
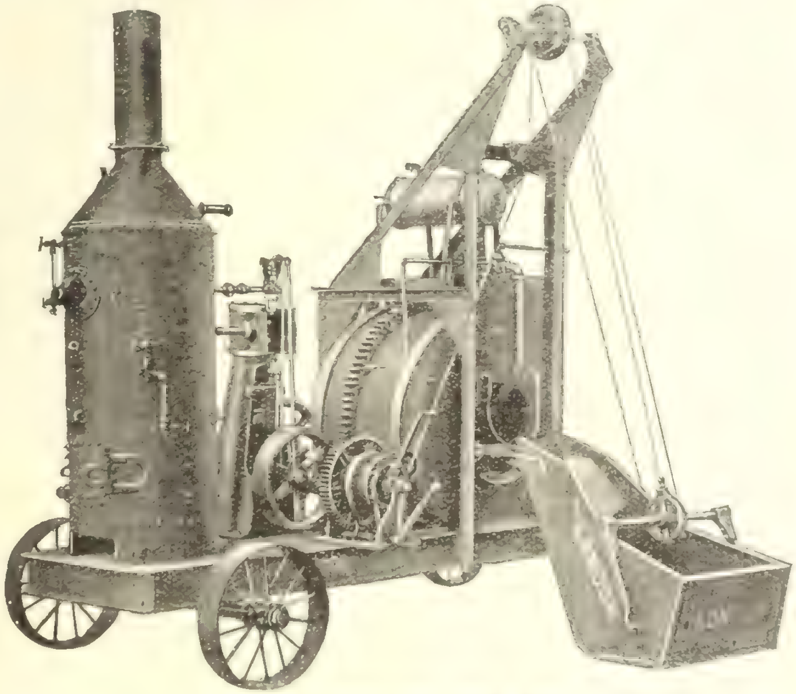
F. S. Coombs, Halifax, N.S.
R. Max McCarty, St. John, N.B.
N. T. Dinnen & Co., Winnipeg, Man.
Canadian Supply & Equipment Co., Ltd., Calgary & Edmonton, Alta.
E. G. Cullen, Vancouver, B.C.

Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



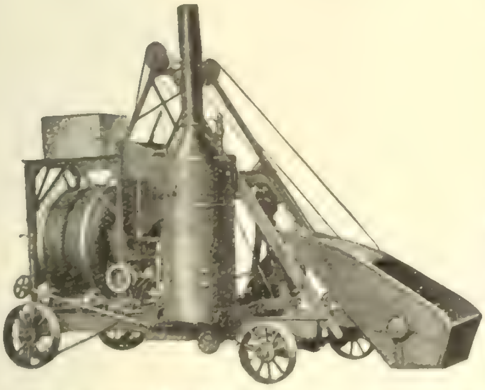
Power Diaphram Pump



London Standard Drum Batch Mixer

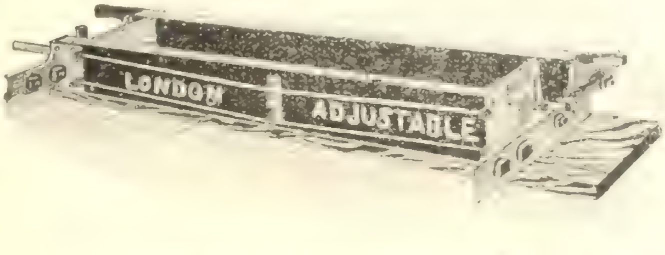
This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.

We are the largest manufacturers of Concrete Machinery in Canada.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.



London Sill Step and Window Cap Mould

A few lines we manufacture –

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Cabell St. and Kitchener Ave., LONDON, ONT.

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TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
HALIFAX (106 Pleasant St.) G. B. Oland, Mgr.

AGENCIES:

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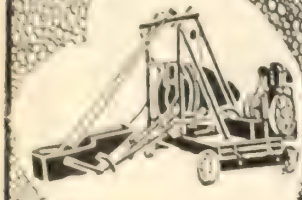
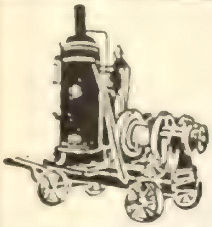
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co.



Wettlaufer Bro's IMPROVED CONCRETE & ROAD MACHINERY

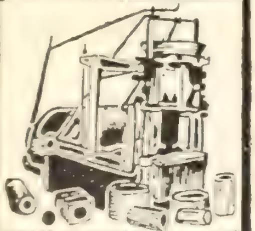
MIXERS

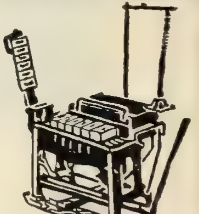
HOISTS



TILE MACHINES

BRICK MACHINES

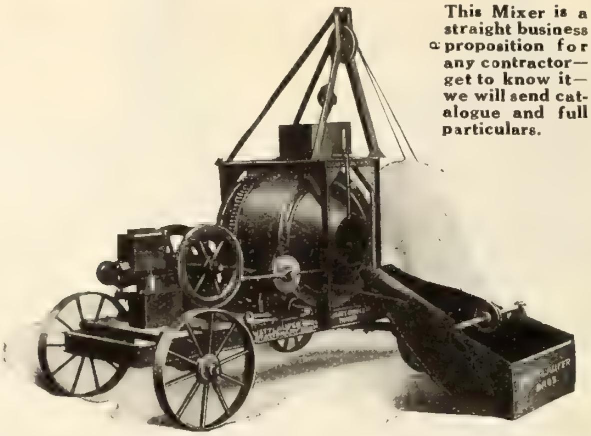




CRUSHERS

PUMPS

We cannot give you any idea of the perfection of this mixer in an advertisement. If you are interested come and see the mixer—it is worth your while.



This Mixer is a straight business proposition for any contractor—get to know it—we will send catalogue and full particulars.

The Wettlaufer Story

No. 6

Work! Well I should smile—you can't put anything over the Wettlaufer Heartshape when it comes to work. Look-at—we sold a man a No. 2 gasoline "to save the labour of hand mixing on his sidewalks." When that was through he went to work and laid his foundations complete with that one mixer. That's *work*—the sort that Wettlaufer Heartshapes are doing all the time.

THE WETTLAUFER HEARTSHAPE MIXER

Solves the concrete mixing problem for every contractor. It gives the **highest grade work** with **no stoppage or delays** and the **minimum cost for upkeep and repairs.**

The Mixer that gives you the **Best Work** at the **Least Ultimate Cost** is the Mixer you will use in the end—think it over.

We will prove to you that this result is always gained with the Wettlaufer New Heartshape Stationary Drum Mixer.

COME AND SEE IT WORKING—CONTINUOUS DEMONSTRATIONS AT

Wettlaufer Brothers

178 Spadina Ave., Toronto, Ont.

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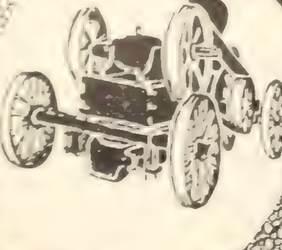
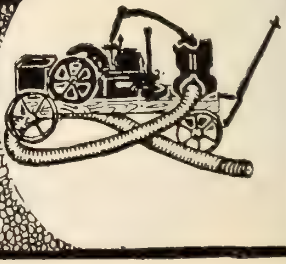
Montreal Office and Warerooms: 316 Lagauchetiere St. W.



THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

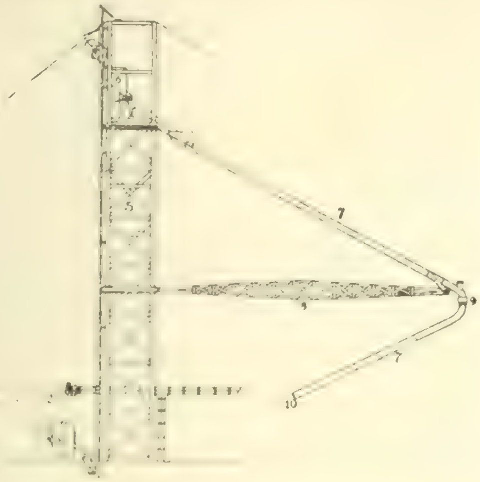


Note tremendous metal weight on this floor. Entire building of Alsen's Cement reinforced concrete.

Alsen's Cement

was selected in 1905 for the Panama Canal in preference at equal prices and has exceeded those severe requirements. Sold under a guarantee other Portlands cannot make in good faith. Other brands have been supplied only on modified specifications.

Alsen's American Portland Cement Works
45 BROADWAY, NEW YORK



Gravity System
Distributing Concrete

A system that improves the concrete and reduces the cost.

Information gladly furnished and Estimates given on any work.

Canadian Concrete Appliance Co. Limited
Sole Licensees for Canada
613 Vancouver Block, VANCOUVER, B. C.
Eastern Representative
STINSONREEB BUILDERS' SUPPLY CO., LTD., MONTREAL, P.Q.

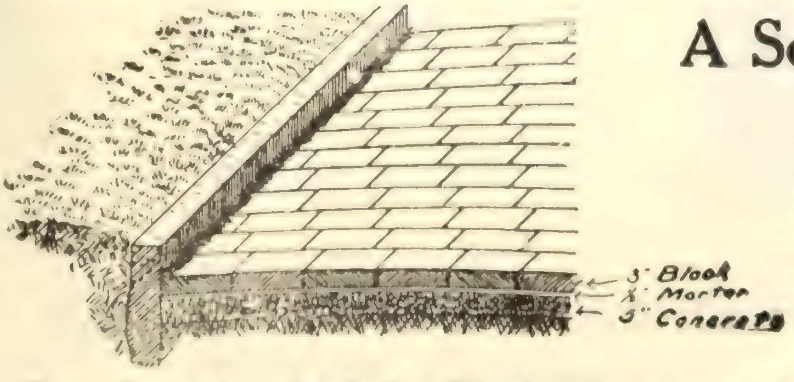
"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL



A Scientific Pavement

must be

Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and Easily Cleaned.

These requirements are met by
Asphalt Block Pavements
Send for Descriptive Literature

The Ontario Asphalt Block Company, Limited - Windsor, Ont.

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Ferranti Electrical Mfg. Co.
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McDougall Caledonian Iron Wks.
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Goheen Mfg. Co.
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Dominion Paint Works.
Goheen Mfg. Co.
Pinchin, Johnson & Co.

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Ontario Asphalt Block Co.
Paterson Mfg. Co., B.
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Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
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Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
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Pedlar People.
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Canadian Sirocco Co.

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Albert Mfg. Company.
Britnell & Company.
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Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

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Canada Foundry Company.
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Beatty & Sons, M.
Canada Foundry Co.
Canadian Boving Co.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Can. Supply & Contracting Co.
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Escher Wyss & Co.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Inglis & Co., John.
McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
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Wettlaufer Bros.

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Canadian Ingersoll-Rand Co.
Improved Equipment Co.
Lecky & Collis.
George Anderson & Co.

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Canada Foundry Co.
Gartshore, John J.
Hopkins & Co., F. H.
Lecky & Collis.
Mussens Limited.

Refrigeration Machinery
Linde British Refrigeration Co.

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Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.
Steel & Radiation Ltd.
Trussed Concrete Steel Co.
Turner, C. A. P.

Revolving Stone Screens
Greening Wire Co., B.

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Canadian Mineral Rubber Co.
Barber Asphalt Paving Co.
Asphalt & Supply Co.

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Dore & Fils.
Erie Machine Shops.
Lecky & Collis.
Morrison & Co., T. A.
Mussens Limited.
Waterous Engine Works Co.
Western Wheeled Scraper Co.

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Asbestos Mfg. Company.
Barber Asphalt Paving Co.
Can. Supply & Contracting Co.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

Power Logic

Reduced Loss
Increased Profit — **Ferranti Transformers**

Three Phase Pole or Station Transformers

The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one because of the great reduction in energy-loss made possible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

Write us for particulars

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

Office of Dominion Iron & Steel Co., Ltd,
Built of Sydney Pressed Brick

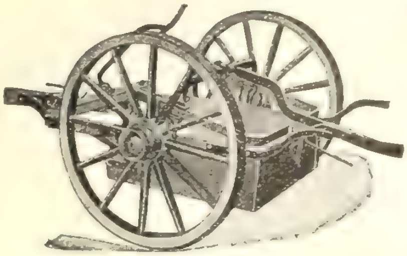
IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

DON'T BE MISLED



THE ORIGINAL AND ONLY THOROUGHLY IMPROVED WHEELED SCRAPERS ARE

Western Wheeled Scrapers

None others are built as strong will give the same satisfactory service or contain the latest improvements.

The Westerns are noted for their capacity, light draft, simplicity and durability. They will shortly pay for themselves, and be paying you a handsome dividend on your investment.

Write for Catalogue.

Western Wheeled Scraper Co.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902
Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS	1903	$ 0.00	1908	$ 93.26
	1904	3.30	1909	200.46
	1905	9.35	1910	14.07
	1906	37.33	1911	2.29
	1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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[illegible] & R[illegible] Co
[illegible]

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Taylor, J. & J.

Sand and Gravel
Ontario Lime Co., Ltd
Sand and Supplies Limited.
[illegible]
[illegible]

Screens
Canada Wire & Iron Goods Co.
Greening Wire Mfg. Co., B.

Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Sewer Pipe
[illegible] & Company.
Canada Iron Corporation.
Dominion Sewer Pipe Co.
Gartshore Thomson Pipe Co.
Joy & Son.
National Iron Works.
Ontario Lime Co., Ltd.
Ontario Sewer Pipe Co.
Smyth & Ryan.
Standard Clay Products Ltd.
Nova Scotia Clay Works Ltd.

Sewer Trenching
Lecky & Collis
Austin Mfg. Co.
Municipal Engineering.

Sound Deadening
Cabot Inc., Samuel.

Shovels (Steam)
Browning Engineering Co.
Beatty & Sons, M.
Canada Foundry Co., F. H.
Hopkins & Co., F. H.
Montreal Locomotive Works.
Mussens Limited.
Thew Automatic Shovel Co.

Shovels
Lundy Shovel & Tool Co.

Smoke Stacks
Des Moines Bridge Co.
Hamilton Mfg. Co., Wm.

Stains, Shingle, Cement & Brick
Cabot, Inc., Samuel.
Pinchin, Johnson & Co.

Steam Apparatus
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Steam Turbines
McDougall Caledonian Iron Wks.

Steel
Canada Steel Co., Ltd.
Dominion Steel Castings Co.
Lecky & Collis.
Provincial Steel Co.

Steel Bars
Canada Steel Co., Ltd.
Steel Co. of Canada.
Steel & Radiation, Ltd.

Steel Ranges
McClary's.

Stone
Britnell & Company.
Brodie, James.
Consolidated Stone Company.
Contractors' Supply Company.
Corinthian Stone Company.
Crushed Stone, Limited.
Hagersville Contracting Co.
Mahan & Company.
McMillan & Son, W.
Morrison & Co., T. A.
Myers Oakley.
Ontario Lime Co., Ltd.
Queenstown Quarry Co.
Roman Stone Company.
Rogers Supply Company.
Sackville Freestone Company.
Sand & Supplies.
Smyth & Ryan.

Stone Saws
Anderson, Geo.

Structural Iron and Steel
Canada Steel Company.
DesMoines Bridge Company.
Dominion Bridge Company.
Dominion Steel Castings Co.
Hamilton Bridge Works Co.
Mackinnon Holmes & Co.
McNeil & Co., W. P.
McGregor & McIntyre.
Phoenix Bridge & Iron Works.
Provincial Steel Company.
Reid & Brown.
Sarnia Bridge Company.
Steel Company of Canada.
Structural Steel Company.
Standard Steel Construction Co.
Walsh Plate and Structural Wks.

Submarine Drills
Canadian Mineral Rubber Co.
Lecky & Collis.

Swinging Gears
Dake Engine Company.

Tanks and Stand Pipes
Chicago Bridge & Iron Works.
Des Moines Bridge Company.
Hamilton Mfg. Co., Wm.
Inglis, John.
Jenckes Machine Co.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Ontario Wind Eng. & Pump Co.
Piggott & Co., Thos.
Walsh Plate and Structural Wks.
Waterous Engine Works Co.

Testing and Inspecting Bureau
Hunt & Co., Robt. W.

Valves
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Company.
Canada Foundry Company.

Ventilating & Heating Apparatus
Canadian Buffalo Forge Co.
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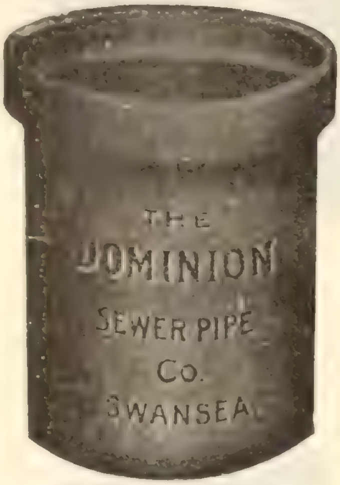

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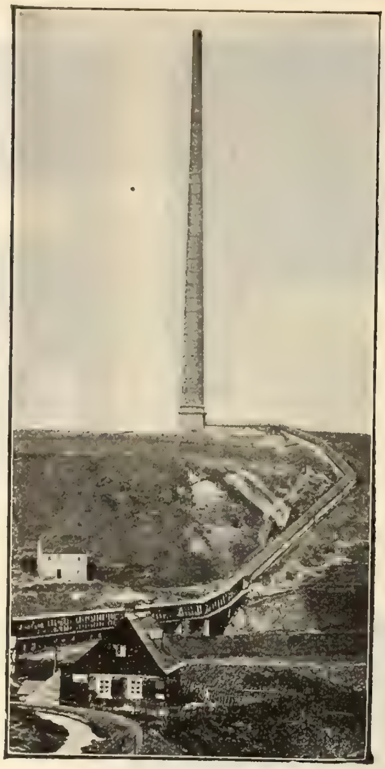

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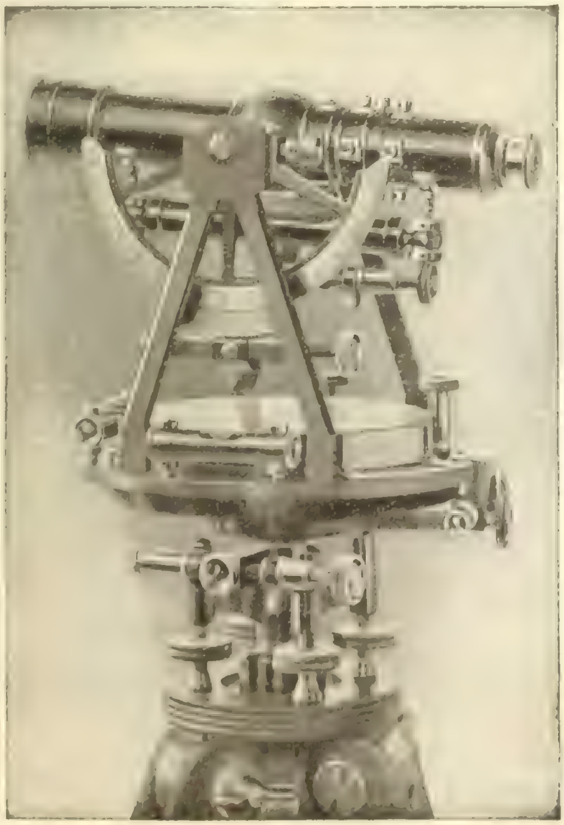

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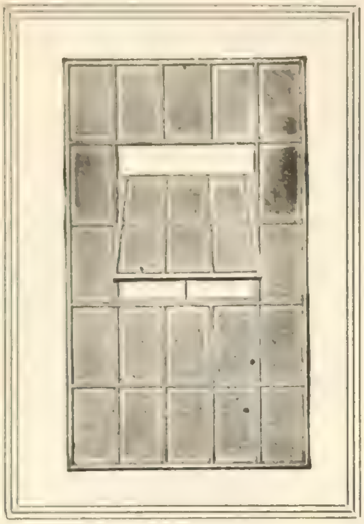

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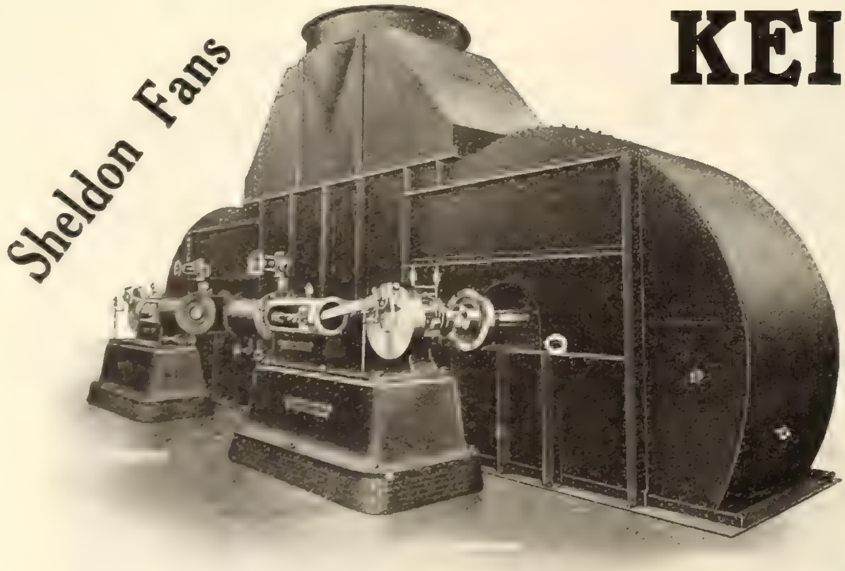

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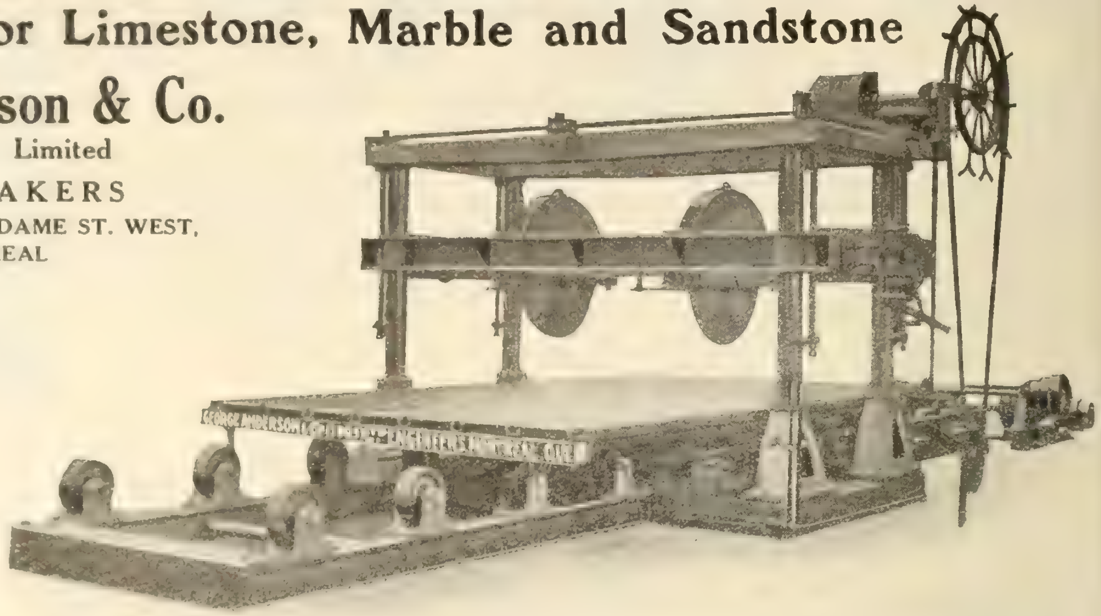

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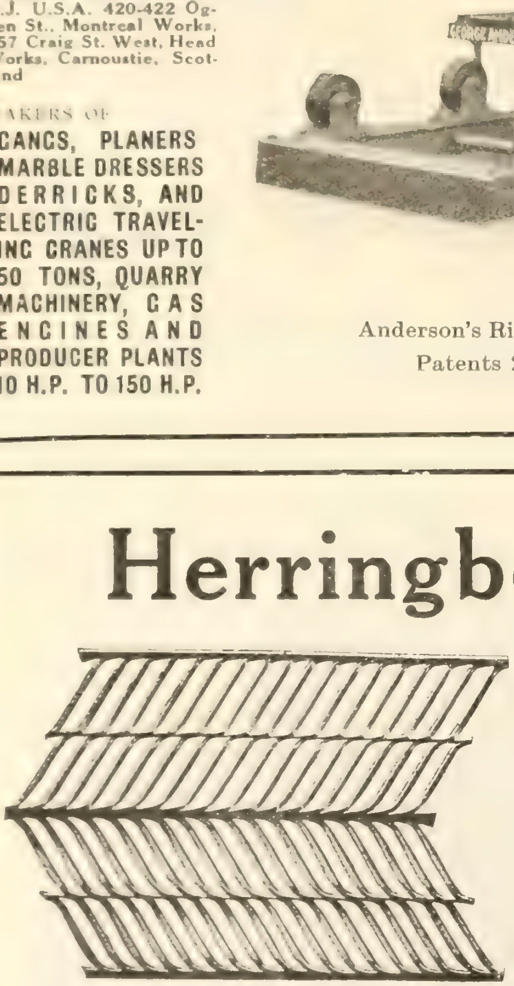

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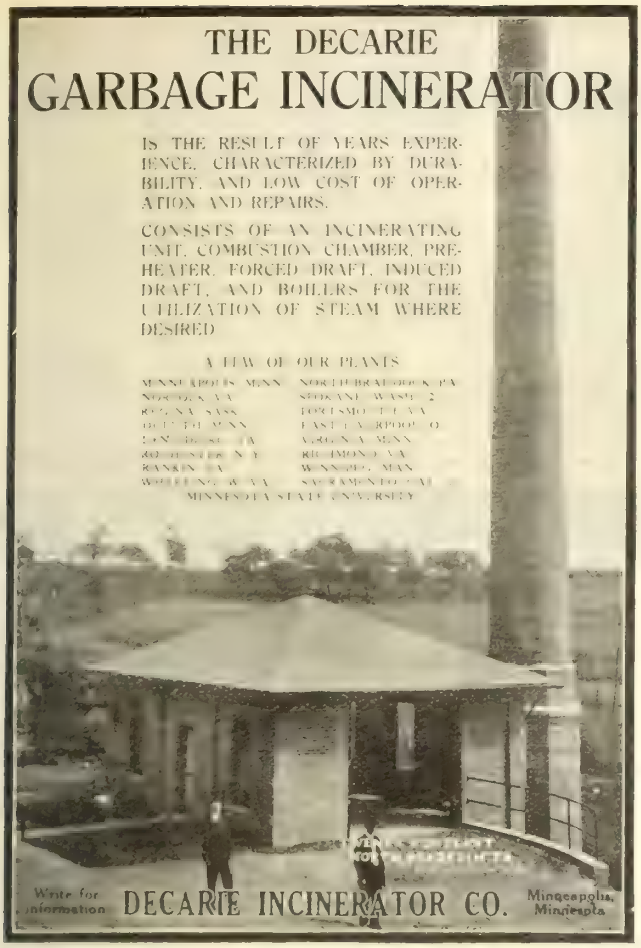

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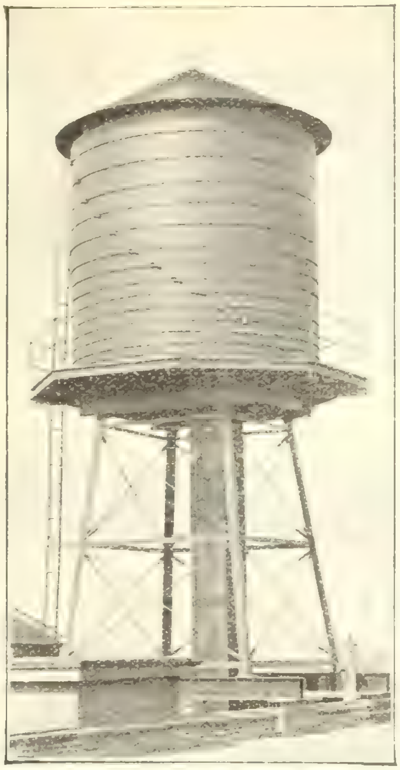

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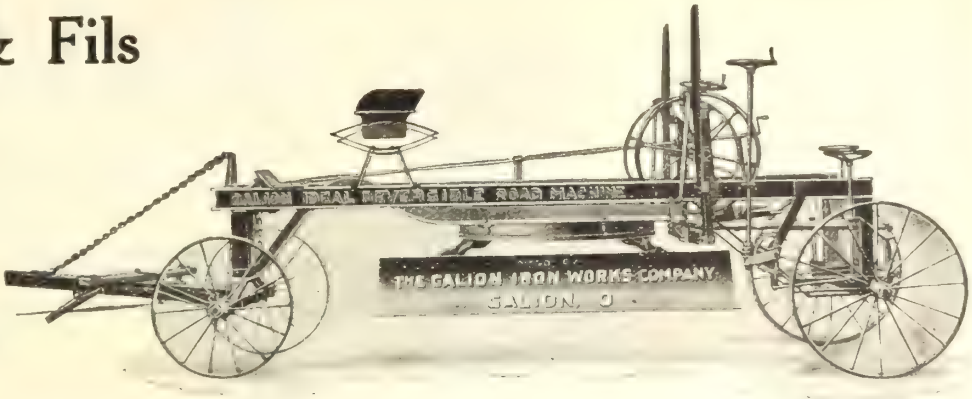
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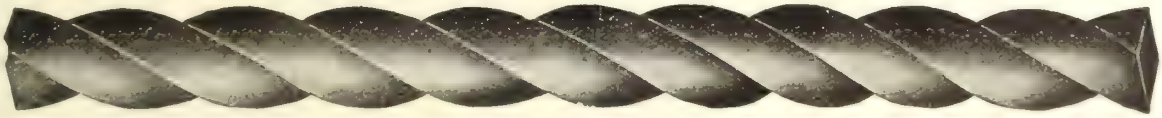

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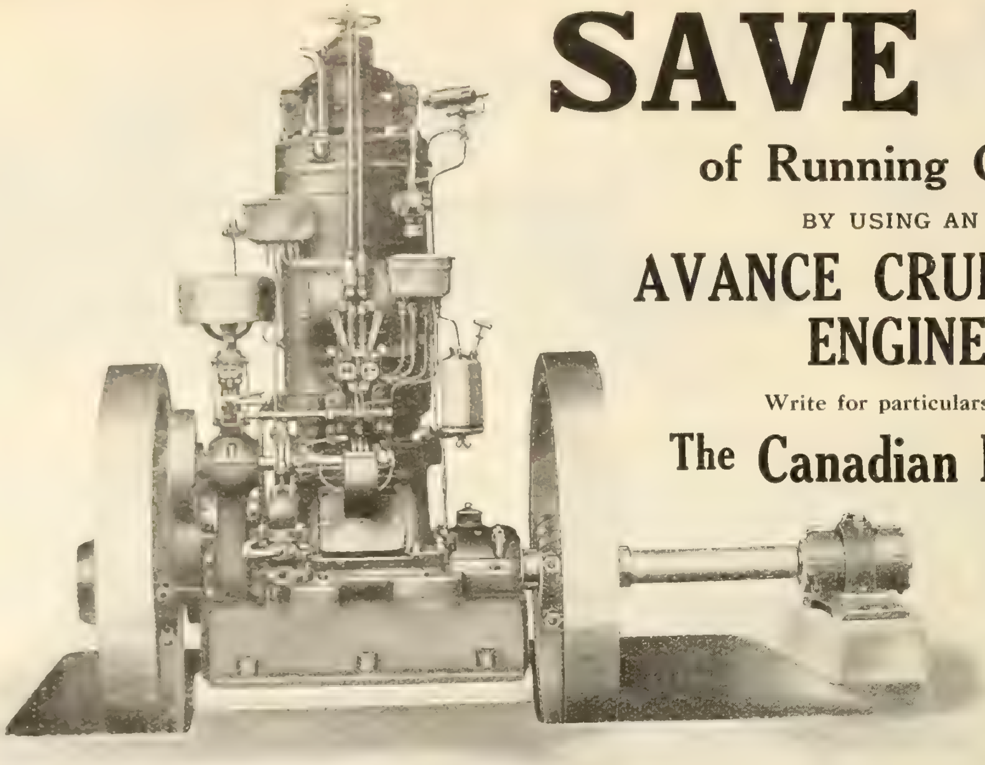

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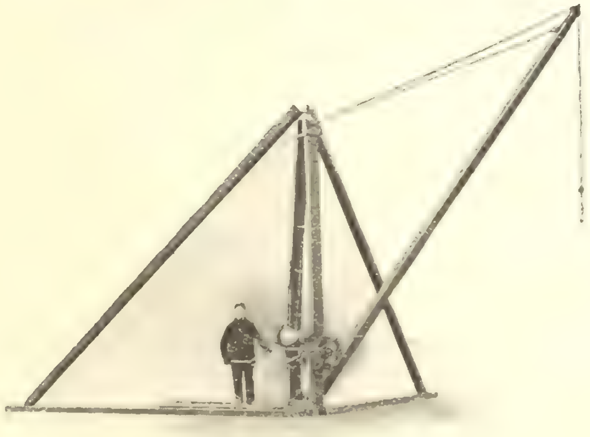

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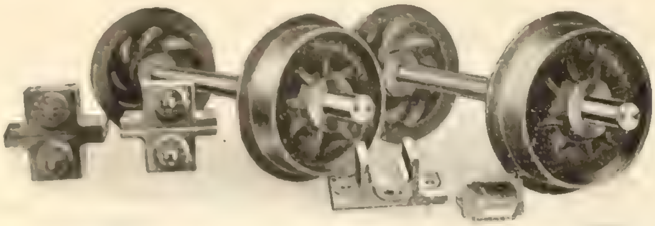

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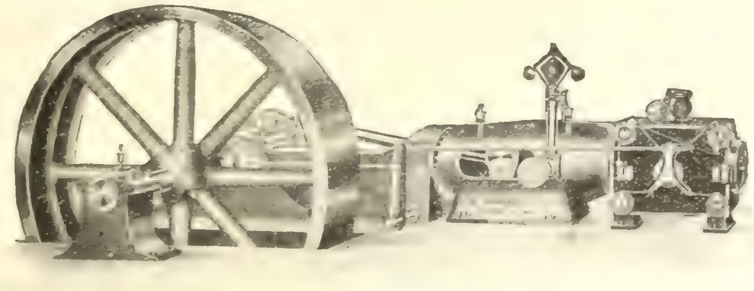

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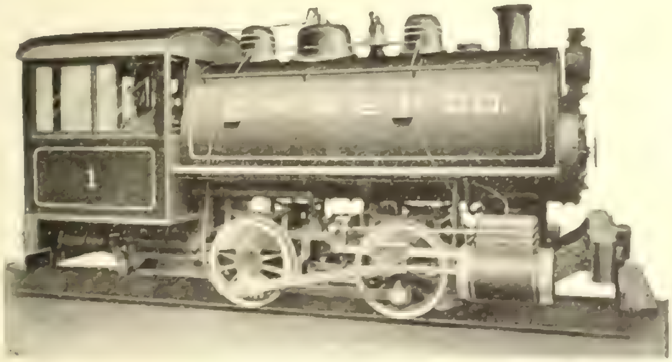

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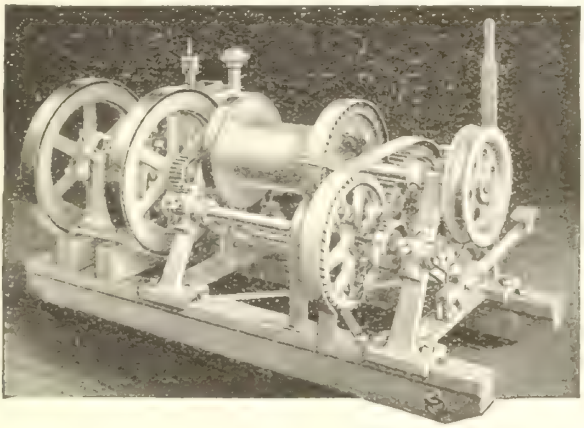

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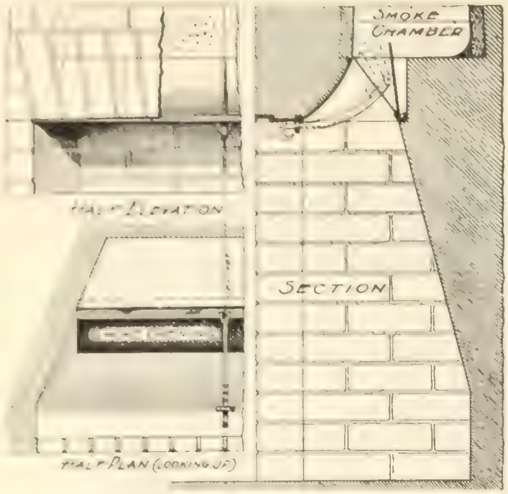

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FOR high speed a High Speed Belt should be used. Great strength is demanded. A belt that is to grip a small pulley and transmit high power must be specially built for the purpose. It must resist the strong tendency to slip on the small, rapidly-revolving pulleys.

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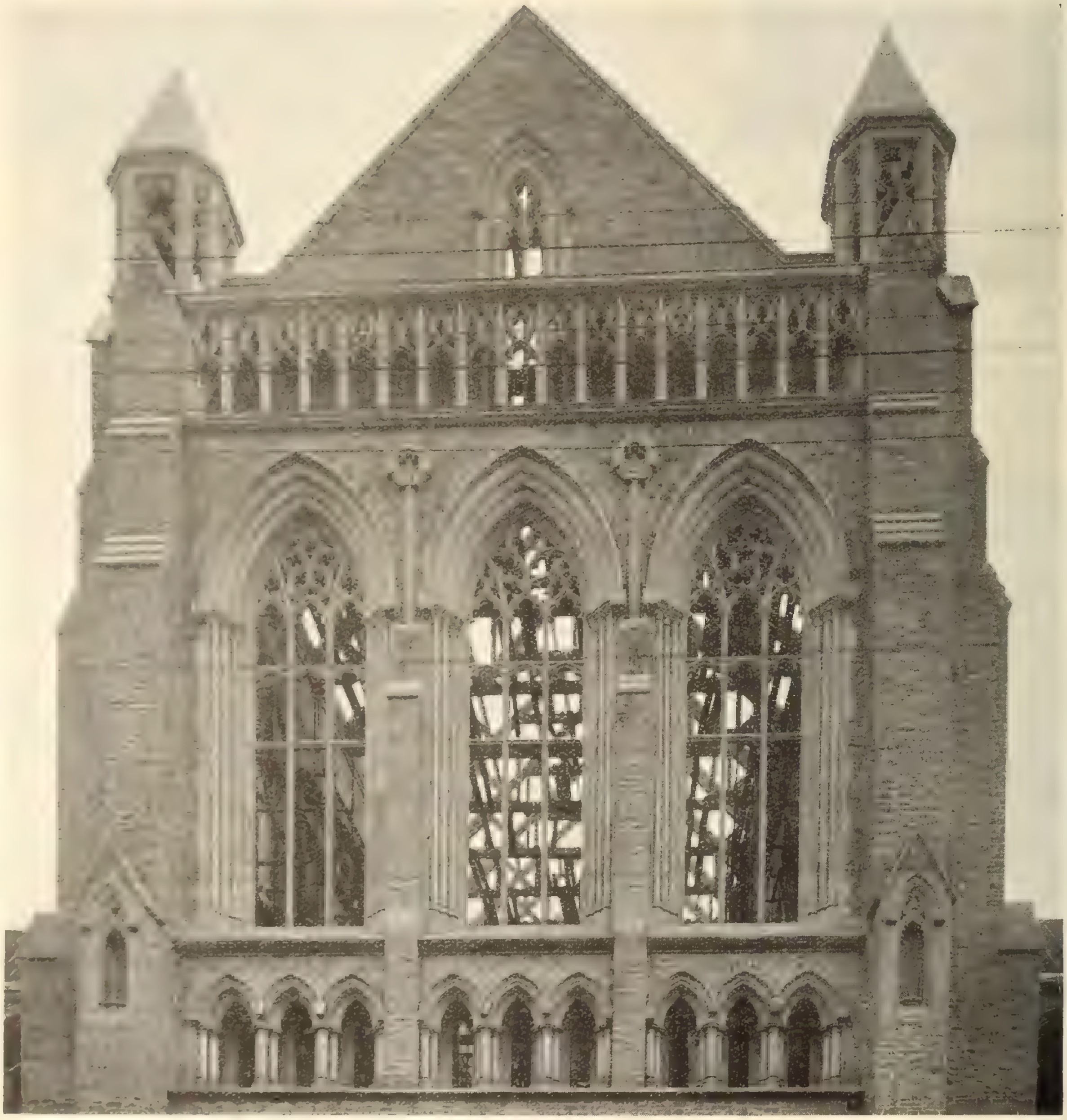

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Roman Stone was used throughout this church for all the Stone Tracery, Arches, Ballustrade, Turrets and Coping, &c.—The work speaks for itself. See the article on page 53 of this issue giving many interesting facts, also photos of the architect's drawings &c.

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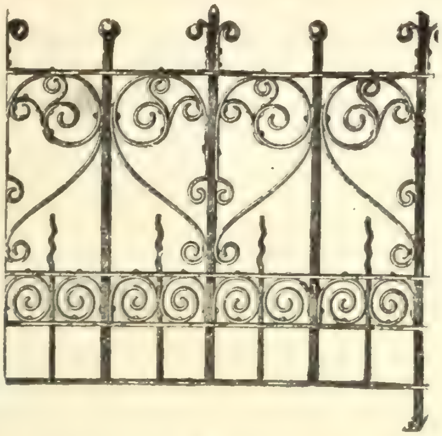

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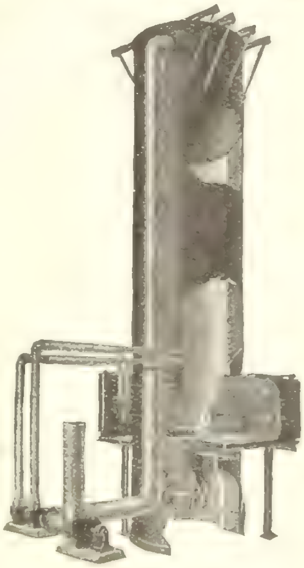

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laid in the diagonal or French style, finished with our regular Ridge Roll.

The advantages of this type of construction are many.

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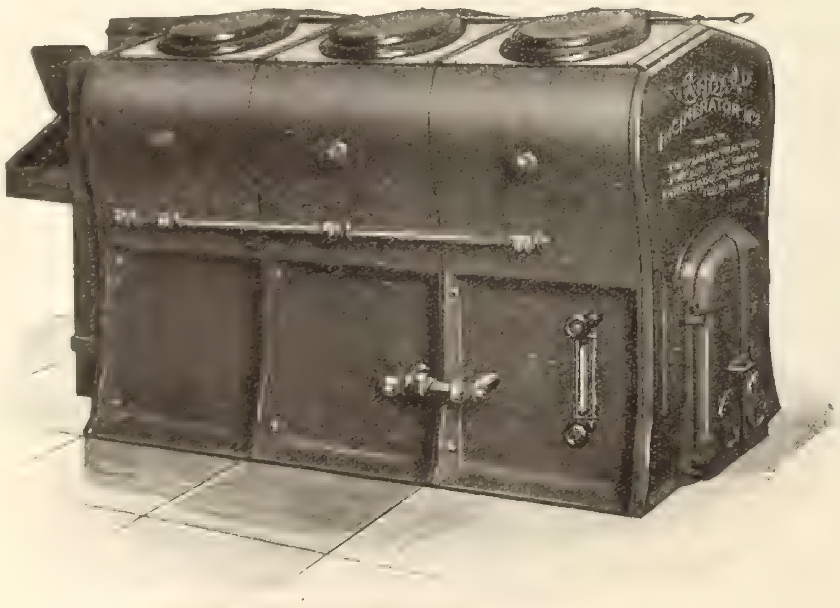

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ESTABLISHED 1886

Contract Record and Engineering Review

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Vol. 27 **June 4, 1913** **No. 23**

The Third International Road Congress

ONE of the events of the year from the standpoint of the municipal and highway engineer is the Third International Road Congress which is to be held in London, Eng., June 23-28, 1913. The Congress is being held at the invitation of the British Government and the meeting cannot fail to give an appreciable impetus to the great work of road reform which was begun at the First International Road Congress in Paris five years ago and continued at the Brussels Congress in 1910.

The official delegate from the Dominion of Canada will be the Hon. Frank Cochrane, Minister of Railways and Canals. The U. S. official delegates are Messrs. Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York; Geo. W. Tillson, Consulting Engineer, Borough of Brooklyn, N.Y.; and Robt. Foote Hall, Chicago.

Last year, it will be recalled, Mr. W. Rees Jeffreys, Honorary General Secretary of the Permanent International Association of Road Congresses, paid a visit to Canada and the United States with a view to interesting the engineering profession in the meeting. While here he appointed a special committee, under the direction of Mr. W. A. McLean, Provincial Engineer of Highways for Ontario, to look after the Canadian interests. As a result of this a fair-sized Canadian delegation will attend the Congress. The delegation comprises: Professor Peter Gillespie, Toronto University; Professor J. McGowan, Toronto University; Messrs. A. T. Laing, C.E., Registrar Faculty of Science, Toronto University; W. A. McLean, Provincial Engineer of Highways, Toronto; H. T. Bowman, County Engineer, Berlin; H. S. Carpenter, Superintendent of Highways, Regina, Sask.; W. G. Trethewey, Toronto; Mr. James L. Chambers, of Messrs. Chambers, Limited, Toronto; W. R. Stone, Toronto; and G. W. N. Day, Editor Contract Record and Engineering Review, Toronto.

It is of interest to note that the editors of two American publications, Good Roads, of New York, and The Contract Record, of Toronto, will report the proceedings of the Congress. Mr. E. L. Powers, Editor of Good Roads and Secretary of the American Road Builders' Association, will be accompanied by Mr. Samuel Hill, of Seattle, President of the last-named body. Another prominent U. S. engineer who is attending the Congress is Major Crosby, of Maryland, many of whose articles have been published from time to time in the Contract Record.

The arrangements for the Congress are on a most elaborate scale. The opening ceremony will be presided over by the Chancellor of the Exchequer, the Right Hon. David Lloyd-George, M.P., while the First Commissioner of Works, the Right Hon. Earl Beauchamp will inaugurate the Road Exhibition. Receptions and conversaziones for the members of the Congress will be held at the Guildhall of the City of London; at the Albert Hall, by invitation of the Institution of Civil Engineers; and at the Royal Automobile Club, while there will be a banquet, by way of conclusion to the Congress week, at the Hotel Cecil.

A large number of interesting excursions, on which many types of road construction will be seen, has also been arranged, both during the Congress week and in the preceding and following weeks. These will include a visit to Windsor Castle, on the invitation of H.M. the King; another to the Garden City at Letchworth, and one to the National Physical Laboratory at Teddington, as well as a trip to Hampton Court Palace, an up-river trip, and various inspections of roads in the counties. The Surveyors' Institute will give a Garden Party at the Royal Horticultural Gardens, and special invitations will also be issued for performances at representative London theatres.

The Programme of tours arranged for the week preceding the opening of the Congress comprises itineraries in Kent and the south-west of England, while those which follow the conference sittings include visits to Eastbourne, Brighton, Folkestone, Chester and North Wales, the Midlands, the English Lakes, and Scotland.

The report of the Congress given by The Contract Record will be direct from the Editor, and it will be the main endeavor to present such points of interest arising at the Congress as will be of practical benefit to Canadian engineers.

Jobs for Young Graduates

IN a few weeks several hundred young men, with the ink still wet on their diplomas from various engineering schools and colleges, will be looking forward to securing their first professional work, and no doubt a large proportion of them, probably more than fifty per cent., will secure it very soon. There are three principal avenues open to all of them to secure employment of a more or less technical nature—through the applications continually on file in the principal engineering schools for reliable graduates to begin various kinds of manufacturing, construction and technical work, through the aid of alumni associations and individual alumni, and through direct individual effort. Thirty years ago the first avenue had not been opened and there was scarcely even a blazed trail to indicate the important thoroughfares that now lead a large number of young engineers toward their promised land. In those days there was very little demand for graduate engineers excepting on railroad location and survey work and the few dozens who wanted their [illegible] work every summer depended chiefly on their own solicitation to secure any kind of employment. Now a large number of engineering plants and organizations regularly call for a supply of new men each year. A number of the large colleges have almost the equivalent of an employment bureau or exchange maintained by the alumni, where any student or graduate may register and receive information of possible jobs. The young man who fails to have a position found for him can always, if he has good health, reasonably fair address and moderate perseverance, secure work for himself. Beyond appealing to personal friends or to men of influence on whom he may feel some claim, letter writing is of little value to him. He must expect to expend a moderate amount of time and money to visit construction work or engineering or manufacturing plants and offices. These are sufficiently numerous in almost all neighborhoods, and he will do well to make a geographically arranged list of those in his chosen territory and make the round systematically, applying at each and leaving his permanent and temporary address, with a very brief and neatly written description of his principal qualifications. He should repeat the entire round of calls every few days persistently renewing his address and requesting to be kept in mind without becoming troublesome. So doing, he will be remembered and be quickest at hand when help is suddenly required, and in the end he will certainly get, perhaps not strictly engineering employment, but at least an opportunity to get started and make good in some sort of work allied to his profession.—Engineering Record.

Removing Handicaps of Young Graduate Engineers

In a recent address to the engineering seniors of the Pennsylvania State College, Mr. Edward Wallace Bush, chief engineer of the East Haddam and Haddam Bridge Commission, departed somewhat from the usual advice to young engineers, in that he explained some of the practical conditions that they are likely to encounter, and how best to meet them and remedy initial deficiencies. Some of the extracts here given are not without interest to engineers not just graduated.

When young college men are given employment they are apt to find themselves in direct competition with others similarly employed who are not college men but who can do the work much better than they, because the others are better trained in practice and more familiar with the precise work at hand.

You will not graduate as engineers, but I know that each here at college has acquired the broad foundation which will permit you to become engineers by your own efforts after you have gained practical experience accompanied by further study.

Learn all you can about all phases of your work. You can always pick up a lot of valuable information from the better class of workmen and foremen. They will probably use a nomenclature which will be to your advantage to learn and which was not taught in college, nor does it appear in the text books.

Some few weeks ago I asked a prominent electrical engineer doing research work and having a number of young engineers as assistants what in his experience he found to be the principal fault of young graduates. He replied that they lacked the personal attitude to tackle the job using "horse sense." They try for some elaborate method to attain a simple result, whereas the non-graduate is more likely to proceed at once to the proper solution of the problem. Usually the man that does not know any better is the one that does the thing that "can't be done."

Team work counts just as much in business as it does in a football game. The college man knows and observes this, which is one reason why graduates are desired for many positions which could be just as well filled by a non-graduate. Esprit de corps is what is wanted. You can do much good in an engineering corps by good naturedly accepting all the hardships that come along. I know a young engineer who was given a very important position last year because he was of a genial disposition no matter what occurred. As the new man on the corps you may be given the mean jobs to do. You may not know it, but probably your superior has his eye on you to see how you carry yourself. You will be tried out in various ways which will recall your freshman days more than anything else. Sometimes the descent from being a "college hero" to a cub on an engineering corps is quite sudden and likely to be accompanied by a bump.

During the first years you are out of college and while the habits of study are still with you is a good time to improve your ability to write and speak correct English. These are accomplishments which will be of great benefit to you in any position as an engineer. You may be without intimate friends and lonesome, and will find this and other studies a good way to fill in your spare time. One young engineer of my acquaintance took up without compensation the reporting for a morning newspaper in a small city of various lectures and addresses just for the training it gave him in writing concise English.

Join technical societies and attend their meetings when you can. This will keep you in touch with the advancements in your profession. Subscribe to technical publications and get interested in the papers and discussions printed therein. At the present time much that is printed in the technical press and reports of technical societies cannot be clearly followed nor understood by you. You wonder why such dry stuff is printed, and read it only by compelling yourself to close attention. The technical press records the great engineering problems of the day, the problems which are being studied and solved by the active engineers of the profession, the kind of problems you will be called on to solve in the course of a few years. Therefore you should make earnest study of this kind of literature in order to get in touch with the kind of work you are going to do later. It will aid you to get the outside viewpoint if you start subscriptions to technical publications at once. Contribute papers when you can, as the preparation of such is excellent practice; also you should do your share in the advance work of your profession. Remember that the text books are about five years behind in recording most of the advances made in any profession and that if you are to keep abreast of the times you must obtain your advanced thought from the other sources mentioned. Do not be too narrow in following up any particular line of study. You may change to a position where side-line information will greatly benefit you. Ten years hence probably 75 per cent. of you will be engaged in a kind of work which you do not now think you are sufficiently equipped to perform.

Wherever you go take an interest in local affairs. Read the local papers and use your influence on the right side of the public questions of the day. As an educated man do your share in molding public opinion so there may be a good influence to counteract the rapid and misguiding utterances of the low type of agitators who are doing so much at the present time to unsettle the industrial world.

Don't be backward about accepting responsibility. Take all the chances that come your way to be placed in responsible charge of work and then work extra hard to acquit yourself with credit, as in that way you broaden out and advance in your profession. The larger pay always goes with the position of greater responsibility. It is always much easier to write good specifications than to get them carried out. Planning in most work is not so difficult as execution; consequently the man at the execution end has the greater responsibility and gets the most compensation. But no engineer can become very successful at the work of one end without an intimate knowledge and experience of the work at the other end. Therefore during the early years after graduation try and broaden your knowledge and experiences of all parts of your particular line of work. In marketing professional services the cheapest thing sold is simple technical knowledge, but when such knowledge is accompanied by skill and a broad successful experience the price paid is very high.

Economy is the governing factor in most of the problems of engineering. They come down to dollars and cents; therefore study costs. Keep records for your private use of all work on which you are engaged.

It does not pay to be unfair in business dealings. Contracts are frequently worded as if the party of the second part was in fact a rogue trying to cheat the party of the first part because there is a possibility that such might be the case and the language tries to guard the interests of the party of the first part in such an event. However, the prababality is very great that the contractor is honest in his dealings and desires his subordinates to do nothing which will affect his reputation as an honest business man. The modern business relation between engineers and others is based on a mutual regard and esteem for the business integrity of the other party.

Cement concrete was the agent employed for repairing a cracked cylinder casting in an American locomotive shop. According to the Railway Gazette, the engine came into the shop with a bad crack in the wall of the steam passage in the right-hand cylinder. The crack was high up on the contour of the wall and in such a position that it was impossible either to weld or patch it, and it was of sufficient size to lay the engine aside from actual work with the trains it was accustomed to haul. As an experiment it was decided to fill the cored cavity in the cylinder around the cracked wall with concrete, and in carrying this out a hole 2½ in. diameter was drilled in the front wall at the extreme top of the cavity. A wooden cover was fitted across the bottom of the cavity as high up as it could be inserted. A mixture of Portland cement and sand in equal proportions was made and worked into a liquid state so that it would run easily. About two wheel-barrow loads of this was inserted through the hole, nearly filling the cavity. It was allowed five days to stand and the engine then went into regular service. Nine months later, when the same locomotive came in for a general overhaul, the repair was examined and found to be in perfect condition, no leakage of any kind taking place. It was decided that it was unnecessary to renew the cylinder. The same method has been employed for carrying out similar repairs on another locomotive.

Economy in Reinforced Concrete

On another page we give an abstract of a paper read at a recent meeting of the Concrete Institute (London, Eng.), by Mr. Jno. A. Davenport. The abstract is taken from our London contemporary, The Surveyor, which comments editorially as follows:—

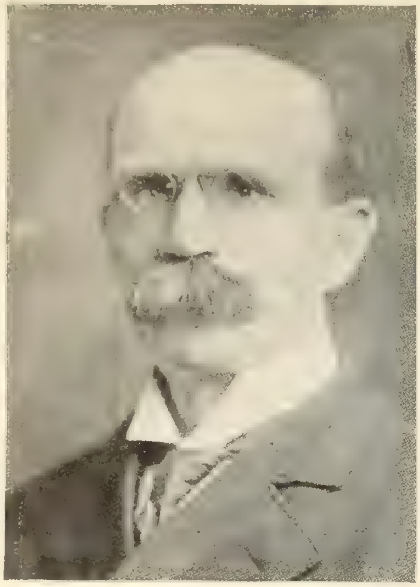
"We give some extracts from the paper on another page, but it is unfortunately impossible for us to reproduce the exhaustive and elaborate series of tables which formed such a valuable feature of Mr. Davenport's communication. It was necessary at the beginning to distinguish clearly between economy as applied to the engineering structure and the same principle as applied to architectural design. Mr. Davenport was only concerned with the former aspect of the subject, and in considering it he dealt with the three fundamental questions of beam section, percentage steel, and arrangement. The paper was divided into four parts, the first being of an introductory character, and the others dealt with the economical beam section, the economical column section, and economy in slab, beam and column construction. The conclusions drawn by the author from the tables appended to the paper are very important, and show the most economical reinforcement percentage in various circumstances."

N. T. R. Looking to Completion

The National Transcontinental Railway, the greatest public work that this country has yet undertaken, will be finished next year. This was the feature of the report on the progress of the work made last week by Hon. Frank Cochrane, Minister of Railways and Canals. The expenditure this year will amount to $19,000,000. The only section of the work on which track has not yet been laid is a 60-mile stretch between Cochrane and Quebec. The total expenditure to the end of 1912 was $127,219,863, and the estimated amount to complete the railroad is $34,087,937. It is expected that the line will be finished to Cochrane this fall, and by next year to Quebec, when the car ferry will be in operation until the great Quebec bridge is completed. The line between Quebec and the New Brunswick boundary will be finished in three months, and the part east of that is now being operated in connection with the Government railways under Mr. Gutelius. The G. T. P. from Winnipeg to the Pacific coast will be completed next year, and trains will then be able to cross the continent

The Constructional Development of Victoria, B. C.

VICTORIA, the City Beautiful on Vancouver Island, has become famous during the last few years. The primary idea suggested by the city of Victoria is that of an ideal place of residence—a city of sunshine and flowers; of a climate to which the rigours of winter and the sweltering heat of summer are unknown; where Nature is seen at her best, and where the most has been made out of the opportunities of artificial improvement. But Victoria has a more substantial prospect ahead of her than that which attaches to a city of the residential order alone. Victoria and the adjacent island country have great possibilities and so it is that we find railroad, manufacturing, mining and timber corporations looking carefully into the merits of the new City of Opportunity.



Mr. C. H. Rust, City Engineer of Victoria, B.C.

The present brief article relating to Victoria takes its place in a series dealing with the development and possibilities of the principal Canadian cities. Ottawa, Montreal, Toronto, Hamilton, Winnipeg, Calgary and Vancouver are among those that have been featured in this series. Each in turn has shown to be a city of opportunity, so that in using the actual expression as applied to the city of Victoria we are not discriminating in favor of the Vancouver Island city. It is sufficient to show that Victoria is entitled to rank with the leading cities of the Dominion as a city of opportunity. We look to great things from Victoria and we cheerfully accord a chapter in the series to setting forth a few facts about Victoria.

It may be of interest to state that Vancouver Island, upon which the city of Victoria is situated, has an area of fifteen thousand square miles. The island is about the same area as the province of Nova Scotia, exclusive of Cape Breton. It is nearly twice as large as the state of Massachusetts.

The climate of Vancouver Island approximates closely to that of Great Britain, modified by its geographical situation. The proximity of the snow-capped Olympian mountains has a marked effect on the summer temperature, which is never intensely hot, while the Japan current, striking the west coast, brings with it moisture and heat, which temper the severity of the winter. The temperature during the last five years, according to statistics furnished by the Meteorological Department, averages 49 degrees, the highest recorded being 85 and the lowest 20.5. The average rainfall for the past five years has been 29 inches.

The population of the city of Victoria is now about 55,000. The growth of the city during the last two or three years has been remarkable. Two years ago there were only three miles of permanent pavement in the city. At this date there are 44 miles of asphalt pavement, 3½ miles of wood block pavement, 12½ miles of macadam, ½ mile of vitrified brick, 1½ miles of tar macadam and ½ mile of concrete pavement, in addition to 120 miles of cement sidewalks. The mileage of water-mains is 123½.

That the development of the city of Victoria has been on quite general lines and that the progress it is making is the result of natural expansion on all sides is evidenced by the building returns of the last four years. The total value of the permits isued in 1909 was $1,673,420. In the following year the building expenditure was $2,198,045, registering an increase of 31% over 1909. The year 1911, with an outlay of $4,026,315, showed a percentage of increase of 83 over 1910, while last year, in turn, with an expenditure of $8,077,370, actually registered an increase of more than 100 per cent. over the high-water mark of 1911

The monthly building returns of the city proper for the last three years is as follows:—

	1912	1911	1910
January	$319,885	$151,455	$128,985
February	671,070	182,940	151,760
March	861,770	279,945	244,760
April	514,850	280,110	192,440
May	662,165	287,335	257,290
June	617,860	250,800	227,600
July	702,840	335,375	222,290
August	430,815	429,960	212,814
September	377,540	406,295	199,686
October	387,215	563,125	124,375
November	788,505	616,625	104,295
December	742,855	242,350	131,750
Total	$8,077,370	$4,026,315	$2,198,045

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*Mr. C. H. Rust, the present City Engineer of Victoria, is one of the best known and most popular engineers in the Dominion. As City Engineer of Toronto for upwards of fourteen years he schooled many of the younger generation through their early professional experiences and many city engineers throughout the country may attribute their professional success to the opportunities given them by Mr. Rust. It is of interest to recall that Mr. Rust was born in Essex, Eng., on Christmas Day, 1852; that he entered the service of the city of Toronto in 1877, was promoted to the position of Assistant Engineer in 1881 and became Assistant Engineer in charge of sewers in 1883. In the last-named capacity Mr. Rust superintended the construction of one hundred and fifty miles of sewers. He became Principal Assistant Engineer of Toronto in 1887, Acting Chief Engineer in 1892, and City Engineer in 1898. Mr. Rust has had a distinguished connection with the professional bodies of the United States and Canada. He is a Past-President of the Canadian Society of Civil Engineers, a Past-President of the American Society of Municipal Improvements, a Vice-President of the American Society of Civil Engineers and a member of the American Waterworks Association.

The inner harbor at Victoria.

Assessment and Banking Returns

The city assessment of Victoria for the last three years is as follows:—1910, $45,000,000; 1911, $60,007,985; 1912, $88,742,130.

The bank clearings in 1912 reflected the general increase in the material prosperity of the city. The Comparative figures for 1910, 1911, and 1912, month by month, are as follows:—

	1912	1911	1910
January	$11,092,519	$ 9,013,716	$ 7,390,767
February	12,610,627	9,078,881	6,404,570
March	13,246,577	12,358,220	7,170,088
April	14,683,203	11,693,804	7,239,383
May	14,814,154	12,670,535	7,485,447
June	14,775,923	11,361,784	9,189,761
July	17,067,927	11,554,631	10,517,023
August	16.254,589	11,394,981	8,865,359
September	15,266,380	9,652,304	7,984,304
October	17,772,643	11,527,732	8,750,129
November	18,119,381	12,869,885	10,386,173
December	17,030,315	11,753,343	10,184.070
Total	$183,544,238	$134,929,816	$101,567,074

Shipping Activities

Victoria is the foremost port in all of Canada. This sounds rather a large statement, but the statistics prove that it is correct. The total for the month of December, 1912, was 845 vessels with a tonnage of 665,261 tons of foreign and coast-wise shipping.

The figures for three-quarters of the fiscal year are close on those of the whole previous fiscal year. Victoria's port business exceeds that of any other port on the north Pacific. The foreign steamships' arrivals and departures of Victoria, as shown in the returns published October 18th, 1912, were 1,957 vessels of 1,929,911 tons, in addition to 3,790 coastwise arrivals and departures of 2,519,266 tons—a total of 5,747 vessels of 4,449,177 tons, exceeding in number those of all the United States ports of the Pacific coast. The foreign trade of Victoria during the first six months of the fiscal year exceeded that of San Francisco for the first seven months by 749,974 tons. The tonnage in and out Victoria, in the foreign trade alone, is over one-third of the total tonnage at all United States ports on the North Pacific.

Municipal Engineering Work

Victoria's constructional activities are progressing by leaps and bounds. The paving figures already given serve, in a measure, to show the activities of the Works Department. The work carried out during 1912 under the supervision of the engineer involved an outlay of $3,400,000.

Of the undertakings completed last year mention might be made of the Dallas Road sea-wall, which was built partly by the Government and partly by the city at a cost of $117,000. This work has already been described in detail in these columns. The Ross Bay sea-wall was completed at a cost of $80,000. A new bridge was constructed across the ravine at Gorge road at a cost of $28,600. This bridge has a span of 60 feet and its total length is 300 feet. The roadway is 38 feet wide, with 6-foot sidewalks on either side.

The causeway and C. P. R. Hotel, Victoria, looking north east from the Parliament Buildings

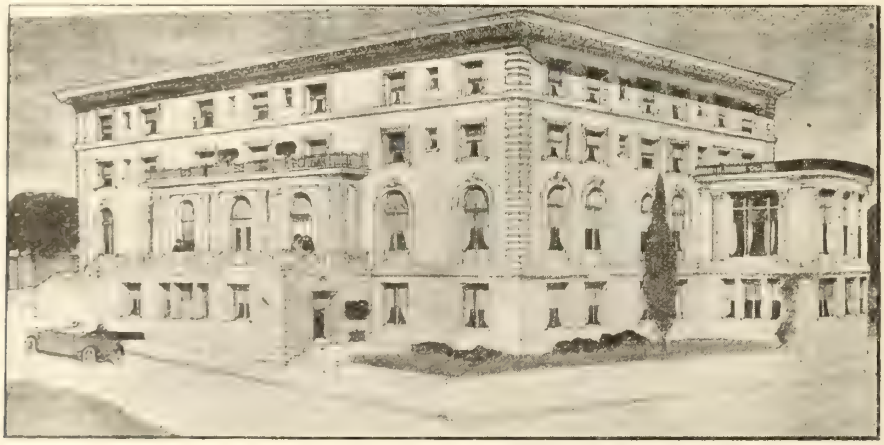
The Pemberton Block, Victoria, completed recently.

Sayward Building, Victoria.

Architects, Messrs. G. C. Mesher & Company.

The total mileage of sewers within the city to date is as follows: sanitary sewers, 97 miles; surface drains, 77 miles. Last year the expenditure on sewer work was $450,000 and the property owners have approved the expenditure of a further sum of $700,000.

Some years ago it was decided to adopt a separate system of sewerage and this plan is still being carried out. This construction, however, according to City Engineer Rust, entails much unnecessary expenditure as the department is constructing a surface and sani-



Proposed Union Club House, Victoria. Architect, Mr. L. P. Rixford, San Francisco.

Victoria High School, designed by Mr. C. Elwood Watkins, and estimated to cost $360,000.

Belmont Building, Victoria.

Union Bank Building, Victoria.

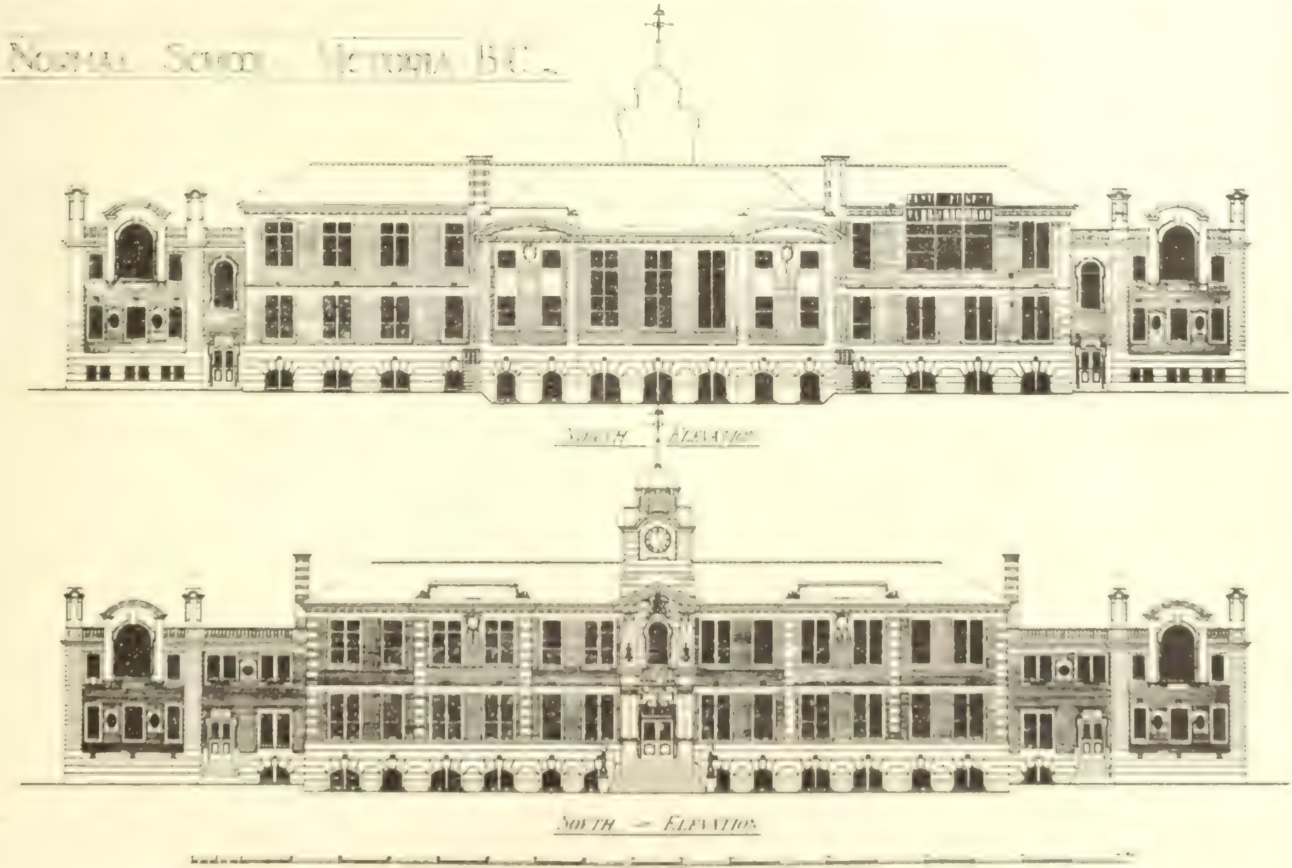
tary sewer on each street and putting a surface and sanitary lateral into each lot. Owing to there being large quantities of rock this work is very costly.

Before a permanent pavement is constructed sewer and water laterals are laid and any other underground work is carried out where possible.

The Smith's Hill reservoir, which was constructed a short time ago, unfortunately developed a considerable leakage and in 1911 the council called in Mr. R. H. Thomson, formerly City Engineer of Seattle, to report upon the best method of making the necessary repairs. Mr. A. E. Foreman, now Assistant City Engineer of Victoria, was appointed resident engineer on the work, which was successfully carried out at an expense of about $67,000. The reservoir is now absolutely tight.

During the past season, owing to the large increase in population and the impossibility of obtaining any more water from Elk Lake, there was a considerable shortage in the city's supply and the water was turned off at the reservoir every night.

A contract was entered into in 1911 with the West-



Proposed Normal School to be erected at Victoria by the Provincial Government of British Columbia
Architect, Mr. W. C. F. Gillam

[illegible] Lumber Company, to construct a conduit line from Sooke Lake. When completed this line will consist of a gravity flow line from Sooke Lake to Humpback Reservoir—27.3 miles of 40 inch reinforced concrete pipe, and a 3-ft. rivetted steel plate pressure pipe-line from Humpback to the city—10¾ miles. Progress upon this work has not been as rapid as anticipated and it will probably be 1915 before the city will be able to procure a supply of water from Sooke Lake. In the meantime arrangements are being made with the Esquimalt Waterworks Company, to furnish between two and three million gallons of water per twenty-four hours to augment the supply from Elk Lake. When the Sooke Lake work is completed it will have a capacity of about sixteen million gallons per twenty-four hours.

The city authorities, realizing the advantage of the motor truck, collect a great deal of the garbage by this means. The city also has one flusher, with a capacity of 1,000 gallons, used in flushing the streets. There are also in use three rock-crushers and five compressors. The total value of the plant belonging to the Engineering Department is about $90,000.

The B.C. Permanent Loan Company's new 10-storey office building as it will appear upon completion. Estimated cost $200,000. Architect, Mr. H. S. Griffith. Contractors, Sound Construction Company.

The city have a well equipped Fire Department, comprising twenty-one horse-driven and six motor-driven fire vehicles, with two runabout motors for the Chief and his deputy. There are eight fire-stations and seventy-three men.

To date, approximately eight miles of streets have been equipped with cluster lighting at an approximate cost of $250,000. The lights consist of about one thousand lamp standards spaced, as nearly as possible, 80 feet apart, each standard being equipped with five 50-watt low voltage tungsten lamps. The total candle power per standard is 200. These standards, operated on a schedule of 4,000 hours per annum, with alternate clusters extinguished at midnight, cost the city ten dollars per annum each.

For much of the foregoing information we are indebted to the City Engineer, Mr. C. H. Rust, for many years City Engineer of Toronto. Mr. Rust's wide experience in the solution of the difficult engineering problems attendant upon the record growth of the eastern city during the period of his administration is an eminent qualification for the head of the Works Department at Victoria.

Municipal Refuse Collection and Disposal Problems

THE miscellaneous refuse collection and disposal data and the statement of the order of the various steps in the analysis of a specific problem of this character here given are abstracted from the paper on Collection and Disposal of Municipal Waste by G. H. Herold before the Civil Engineers Society of St. Paul, as published in the Journal of the Association of Engineering Societies.

The average weight of garbage is 1,150 to 1,475 lbs. per cu. yd. The average weight of mixed rubbish and ashes is from 800 to 1,100 lbs. per cu. yd. In summer the mixture is 35 per cent. ashes and 65 per cent. rubbish, and in winter 75 per cent. ashes and 25 per cent. rubbish.

An analysis of ashes in numerous cities gives 19½ to 24½ per cent. unburned coal.

A garbage collector can collect from 40 to 90 places in an eight-hour day. The time spent in getting in and out from the houses is about one half of the total time consumed by the collector.

The average time required to remove garbage from a house is about three minutes. The average rate of travel for a garbage collecting wagon is 2¾ to 3 miles per hour.

It is cheaper to make the collection with teams; but, after the wagon is loaded, it is cheaper to haul the load to the plant with a motor truck, putting the team on to another loading wagon.

Men should precede the collecting team and bring the can out to the curb, and a man should follow and return the can to the back door, to reduce the idle time of the team.

A portable paper baling machine hauled by one horse is an aid to the city cleanly and a paying institution.

In cities the garbage produced per capita is from 175 lbs. to 225 lbs.

The rubbish and ashes produced per capita are from 325 to 530 lbs.

The separate system of collection, separating garbage from other refuse, makes a filthy garbage can, which can be a greater nuisance than the garbage.

The mixed collection of garbage, house sweepings, ashes and rubbish makes a much cleaner material to handle and prevents fly-breading and lessens the dust nuisance from the ashes. The mixed collection can be made at less cost than the separate collection.

With these data one can proceed to make a study of any particular city. The first step is to get out a density of population map. This has been done for St. Paul by taking the number of voters registered in the 1912 election and the city directory population for the same time and determine the ratio, which for St. Paul is 5.73. Using this factor and the registration records for each precinct in the city, the approximate population of each precinct has been determined.

The next step will be to work out the cost data for various systems of collection and disposal. Assuming that incinerators will be used, the capacity of each incinerator would be decided upon, say 75 tons per day. As we should figure on this plant being capable of handling a certain district for a certain number of years, we figure on running it to a capacity of 60 tons, with the present population. On the basis of the amount of garbage and refuse per capita already given, this size plant would serve 50,000 people.

The next step is to divide the city into districts, taking into consideration railroad tracks, bridges, grades, etc., with 50,000 population each and with the proposed incinerator plant centrally located in this district.

The question of type and size of wagons must be decided upon. Too large wagons cannot be used where there is much snow. On the other hand, wagons should be as large as possible. In Seattle, wagons of a capacity of 1.6 tons, or about 3 cu. yds. are used; 15 wagons for each 50,000 of population.

My investigations show an extreme variation of cost of collecting refuse in various cities. It is a problem that should be worked out very carefully. In fact, I believe there is more chance for working out economies in the collection and transportation of the wastes of a city than in any other field

A reduction plant should also be figured on in order to make a comparison of the cost of two methods. It is probable that in St. Paul such a plant would have to be erected down the river, near the packing houses, and loading stations for garbage established on the levee. The garbage would be taken to the reduction works by means of barges, equipped with tanks which could be hoisted from the barges at the plant and unloaded. The cost of collection would then have to be refigured for handling all garbage to two loading stations, one on each side of the river. It is probable that for a few years we could then continue to use the dumps for ashes, rubbish and street sweepings. Manure is now hauled away by farmers. But it would be necessary to figure on eventually establishing incinerating plants for the destruction of these refuses, as the city becomes more densely populated. To decide upon the types of furnaces for destructor plants and the system of grease recovery to be adopted, with the necessary machinery, is a problem which will require the inspection of plants actually in operation, showing fully their advantages and disadvantages.

To determine the relative economy of the reduction process or incineration of all refuse the cost must be reduced to annual expenditures, taking into consideration that the reduction process disposes of garbage only. Such costs would include the cost of collection and delivery at plant, operation of plant, interest on the investment, depreciation of equipment and plant, and all repairs, land rental, insurance, etc., and also the credits from stone dust, which can be used in our municipal asphalt plant and take the place of material for which we now pay $1 per cu. yd.; and the clinker, which can be crushed and used as crushed stone is now used; also steam for the generation of electricity or heat; also grease, fertilizer, base, etc., the last two being by-products of a reduction plant.

Proceeding along the above lines, comparison can be made by which we can decide which process would be the most economical. Any estimate of cost of the reduction process must, however, include the cost of disposal of other refuse in a modern way in order to compare it with the cost of the destructor process. St. Paul has an area of 55.50 miles square and over 800 miles of streets. It was evidently laid out for a city of homes, but the large majority of the people prefer to live in apartments with the result that certain residence districts are thickly populated, while others are very sparsely settled. Any system of refuse collection makes necessary the traversing of all these streets over the entire area of the city. This will increase the cost of collection per capita as compared with some other cities of the same population but smaller area and with the population more evenly distributed over their areas; furthermore, the apartment house districts are a fruitful field for the licensed garbage collector, as a large amount of garbage can be collected from a small area and in a very fresh condition. It is also garbage very rich in food for animals. A reduction plant would not pay unless 75 tons per day of garbage could be taken to it, and this is very close to St. Paul's present garbage output. Of this, approximately 40 tons are taken by private collectors and the city would have to eliminate these private collectors, if it should adopt the reduction process, in order to make a paying proposition.

The problem is one, however, which can be estimated very closely, and definite figures can be determined indicating the probable per capita cost of whichever process it should be decided to adopt.

At Handsworth some reinforced concrete sewage tanks were constructed in ground saturated with water from a depth of about 5 ft. downwards. The water was drained to a sump and pumped away during the whole time the tanks were in course of construction, and when the work was complete the shuttering was withdrawn and the working space all round the tanks filled in, the subsoil water pumps were stopped, and the water outside the tanks allowed to resume its normal level of 16 ft. above the floor of the tanks. It was known that the dead weight of the tanks themselves would be insufficient to counterbalance the upward pressure of the subsoil water, but it was at first intended to hold them down by the weight of the pumping station buildings. Eventually, however, only the engine-house was built over a small portion of the tanks, and it was decided to rely upon the weight of earth filling bearing on the flanged projection of the bottom slab. As the subsoil water began to attain its normal level the tanks were found to be lifting at the end furthest from the engine-house, the maximum displacement being 6½ in. The subsoil water pumps were at once re-started and the water level lowered, water being at the same time admitted into the tanks, so that the levels inside and outside were soon equal, the result being that the tanks went back into position with practically no damage. Apparently the reason why the anchorage proved insufficient was because the filled-in material compressed as the tanks rose. This was afterwards remedied by filling the trench all round the tanks with concrete.

The Government have granted the Canadian Northern Railway a subsidy of [illegible] of which $14,000,000 is for the main line. The main line from Ottawa to Yellowhead, according to the company, will cost $90,000,000 to construct, and an additional $40,000,000 for terminals now building at Montreal, Ottawa, Port Arthur, Winnipeg and in British Columbia. Rolling stock is excluded.

Economical Operating Methods in Water-Works Pumping Plants

IN studying possible economies of construction and operation for power stations, one must consider three factors; the rental due to the first cost of building and equipment, the cost of fuel, and the cost of labor. A power plant which is used ten or twelve hours a day for weekdays only will not always pay the interest on expensive equipment and must get along with moderately economical machinery. A plant which has a fluctuating load cannot afford compound or triple-expansion engines because of the extra expense of reserve units. A pumping station, on the other hand, with its 24-hour schedule and its reservoirs and storage tanks to steady the load, may well afford the best equipment which can be bought. The saving of fuel and labor in this case is continuous and will offset a much larger interest account than for the plants first mentioned.

To illustrate, I will quote a few figures from ordinary power station practice, since the principle involved is the same. The cost of buildings and equipment for a first-class power house having 1,000 h.p. capacity will be about $80,000, or $80 per h.p. Possibly $60 of this sum represents the cost of engines and boilers, and the remaining $20 the cost of building and accessories. Assuming 10 per cent. for interest, depreciation, etc., we have the following division of annual cost per horse power in a plant of this size:

Rental	$ 8.00
Labor	10.00
Fuel	16.00
Incidentals	4.00
Total	$38.00

Various authorities give the annual cost of a horse power in a plant of this size as from $35 to $45 for 24-hour service. It may be seen from these figures that a saving of 10 per cent. in the fuel and labor bills will pay the interest on more than one-third the cost of equipment. We may, then, expect to see in a pumping station, compound or triple-expansion condensing engines, water tube boilers with chain grate or underfeed stokers, and mechanical methods of unloading, crushing and feeding the coal. The engine should be selected with a view to its economy and its durability. The test guarantee insures the former, and the weight per unit of capacity is a fair gage of the latter. In choosing between an engine which guarantees 18 lbs. of steam per horse power and on which guarantees 16 lbs. under the same conditions, we must remember that this difference represents a saving of 11 per cent. in fuel alone, or approximately $1.75 per horse power per year. One thousand seven hundred and fifty dollars will pay the interest and depreciation on quite a respectable sum of money, probably much more than the difference in cost of the two engines. Condensation adds 20 or 25 per cent. to the capacity and economy of the engine and in a water-pumping station costs but little.

After all, it is the boiler room that the greater losses occur, and it is here rather than in the engine room that the up-to-date engineer will look for improvements. The boiler room is likely to be a rather dark, dirty sort of a place and its dull surfaces and dusty atmosphere are likely to be in marked contrast to the polished brass and steel of the room where the pumps are located. A little attention paid to the proper lighting and ventilating of this usually gloomy spot will be a profitable investment.

The efficiency of a boiler is the ratio of the heat units actually put into the steam to those available in the fuel and is usually about 60 per cent., when it might well be 70. Four hundred steaming tests of western coals reported by Professor Breckenridge in 1907 show boiler efficiencies ranging from 55 to 70, with an average of about 65 per cent. An efficiency of 60 per cent. means that the coal is doing about one-thirteenth less work than can reasonably be expected at a loss of from 15 to 20 cts. for each ton of coal burned. The losses which go to make up the 30 or 40 per cent. to be accounted for may be considered in the order of their importance as: 1. Escape of heat in chimney gases. 2. Loss of unburned gases. 3. Loss of unburned fuel in ash. 4. Radiation to ash pit and from outer brick work.

The first may be 15 or 20 per cent., the second 5 or 10 per cent., the third should not exceed 5 per cent., while the fourth is not to be measured directly, but represents whatever is otherwise unaccounted for. The first three losses above mentioned may be reduced to their lowest terms by simply insuring reasonably complete combustion of the fuel used. This involves the use of a mechanical stoker of a sufficient draft with good damper control and intelligent attention on the part of employees. In other words, efficient combustion requires a uniform supply of fuel and of air in the proper proportions and a thorough mixing of the two at a proper temperature. Doubtless, hand firing might be made to meet these conditions, but it rarely, if ever, does meet them. Irregular supplies of fuel cause the escape of unburned gases to the stack and unburned carbon to the ash pit. Irregular or poorly adjusted air supply causes variations in the stack temperature and, consequently, poor combustion. Too much air checks combustion and lowers stack temperatures; too little air causes incomplete combustion, smoke and dirty tubes. To properly regulate these two important factors, one must resort to mechanical aids, which are more or less automatic in their action.

To make this need clear, let us consider the aids to boiler room economy in their order. The coal should be delivered in hopper cars, weighed on track scales at the plant and occasionally sampled by a competent chemist to determine its constituents. This procedure has an excellent moral effect on the coal company, even though it leads to no direct results. Properly, coal should be bought on a sliding scale in proportion to its heat value, but this is rarely done. The coal should be dumped from the cars into a bin underneath the track; and from that point, until it reaches the hoppers of the automatic stokers, it should be handled entirely by machinery. The labor expense will be reduced to one-fourth or one-fifth of that required when the fuel is unloaded and transported by hand. In like manner the ashes should be carried by machinery to the car or to the dump, and should be weighed in transit. The weight of ash is one indication of bad or good firing. If the chain grate stoker is used, experiments should be made with different thicknesses of fire and different rates of speed to determine which are best adapted to the kind of fuel burned and the particular load carried.

In like manner, tests should be made with various degrees of damper regulations to decide how much and how little draft can be advantageously used. Automatic damper control can then be adjusted to care for this permanently. Every boiler plant has its own personal equation, which must be worked out by the engineer in charge. A CO_2 recorder should be installed to show the composition of the stack gases and a good dial thermometer should be inserted to show the temperature. Some kind of automatic feed regulator should control the water supply of the boilers; a uniform boiler feed at a uniform temperature tends to make other factors more uniform and to improve the economy all around. Recording gages and a recording feed water meter are good investments if kept in order.

So far we have considered the installation of suitable machinery and apparatus for getting economical consumption of fuel. When all this is done, there remains the equally important problem of labor; unless that is efficient and well organized, all our pains have been for nothing. While the introduction of improved machinery cuts down the number of men employed, it necessitates a better quality of labor. Engineers and firemen who are to care for triple-expansion engines, water tube boilers and expensive coal handling machinery must be the best in their several classes—men who have the mechanical instinct, a good degree of common sense, and men who are absolutely dependable. No man who drinks should be allowed inside the building, and politics should be kept outside the gates. A daily log should be kept, which may include most, if not all, of the following items for the fire room: 1. Weight of coal burned. 2. Weight of ash rejected. 3. Weight of boiler feed. 4. Pressure at steam gage. 5. Temperature of stack gases. 6. Temperature of boiler feed. 7. Per cent. of CO_2. For the engine room. 8. Volume of water pumped. 9. Pressure at head gage. 10. Level of suction well. 11. Pressure at condenser. 12. Temperature of superheat.

The gages and recorders should be of the recording dial type and the cards should be submitted with the log. A graphic log of the more important data should be kept by the chief engineer and hung on the wall, where it may be inspected at any time. It takes but little time each day to make these records, and they inspire its efficiency and the methods of improving it. After a time the firemen will, of their own pleasure, watch the readings of the CO_2 recorder and the various gages and appreciate their significance. The bonus system may be made effective by paying each employee a monthly bonus graded to his rate of pay and to the improvement in operating conditions. The pumping station I have described is an expensive one and might not be justified in all its details when the plant is a small one, but the principle is the same throughout. We must try to save fuel and labor, rather than to economize on overhead charges, if we are to have an efficient station and one that will justify itself for a term of years.

Highway Construction with Paint Binder and Its Sheet Asphalt Surface

A type of construction not generally used in the building of interurban roads is being employed on Route 2 of the state highway system of California on the section lying between South San Francisco and Burlingame. The most unusual features of the construction are the thin asphalted binder coat and the 1-in. sheet asphalt surface. The following description of the work on this section is abstracted from an article by Mr. A. E. Loder, Division Engineer, in the California Highway Bulletin, the official publication of the State Highway Commission:

The roadway is graded to a width of 40 feet, with a maximum gradient of 4 per cent., conforming with the rolling contour of the country. Long, easy, vertical curves connect all changes of grade, producing a pleasing profile. Flat curves are used at every deflection in the line.

The pavement is 24 feet in width and has a crown of 4 inches. Earth shoulders containing gravel and old macadam extend to a width of 8 ft. along each side of the pavement with a cross slope of 1¼ ins. per foot. The pavement rests upon a thoroughly compacted sub-grade composed of old macadam and a sand-clay mixture resembling hardpan, which after rolling is in such condition that it is not damaged when the gravel and sand are hauled and dumped directly upon it without the use of planking, and it remains so compact that no dirt is picked up with the sand when loading it into the mixer.

Timber headers 2 ins. by 6 ins., nailed to stakes, line the pavement trench and are laid to a line flush with the finished surface. These protect the edges of the pavement while the shoulders are being settled by traffic, and provide a means by which the pavement may be readily brought to a true and uniform surface.

The pavement consists of a 5-in. concrete base composed of a 1:3:6 mixture, to which is bounded a standard sheet asphalt surface 1 in. in thickness.

The concrete is prepared in a portable mixer to a rather wet consistency and is delivered directly to its place in the pavement by means of a swinging spout. The surface is given a rough finish, suitable for binding bituminous material, by sweeping across the line of pavement with a stiff house broom or warehouse broom before the concrete reaches its final set. The new concrete is watered daily, except in rainy or damp, cloudy weather, until about five days old.

The asphalt wearing surface being laid on this job is shown on the daily test sheets to be as near the standard grading and composition as is possible to obtain. Nothing unusual is noted in connection with its use, except that a greater density is obtained after rolling the one-inch sheet than is possible with a thicker city surface, and consequently better wearing qualities and more stability should be expected.

When the concrete is dry and at least one week old, it is thoroughly swept, removing the dust of traffic passing at the side of road. The binder coat is then applied. This coat consists of 1 part by volume of melted asphaltic cement, of the consistency used in the pavement, to 2 parts by volume of engine distillate. The asphaltic cement is heated in a small portable kettle to a temperature between 200 deg. and 325 deg. A measured quantity is removed to the spreading pail a safe distance from the fire and allowed to cool to about 250 deg. The distillate is then added and stirred for about one minute, when it is found to be thoroughly uniform and the temperature is reduced by at least 100 deg. The distillate can be added when the asphalt is at a temperature of 325 deg., but at this temperature it is accompanied by considerable boiling and is somewhat dangerous.

The binder liquor, while hot, is poured over the concrete from buckets, and uniformly swept over the surface with stiff house brooms until every particle of surface is coated with a thin film and all excess is swept from holes or depressions in the concrete. The paint binder penetrates deeper into the concrete when permitted to flow in a thin wave ahead of the first sweeping. A second sweeping after a few minutes removes excess from depressions and spreads it uniformly over the concrete. The thinnest possible application of paint should be used so that after evaporation, which is completed in from one and one-half to two hours, the surface should have a glossy black appearance. If too small a quantity is used, or if the percentage of asphaltic cement to distillate is considerable less than above, a brown surface will result, which will not make a successful bond with the asphalt surface.

Two men can easily mix and apply this asphaltic coat on 12,000 sq. ft. per day. On 69,000 sq. ft., where the proportions were being varied somewhat, it was found that 100 sq. ft. required 0.856 gal. of engine distillate and 3.5 lb. of asphaltic cement. The total cost on above area, including 15 per cent. on labor, was $0.0018 per square foot of surface.

It is found that no inconvenience is caused to the work of laying asphalt by the placing of the asphaltic coat. After one hour's time it does not stick to the wheels of motor trucks or wagons. It is not desirable to so cover the concrete farther ahead of the asphalt work than is required for the distillate to evaporate and leave the binder hard.

In one case, several days' rain which fell on paint freshly applied caused the asphaltic coat to appear loosened from the concrete in many places. After two days' dry weather, however, it seemed to bond again to the concrete so that it could not be removed. It is believed that the paint binder will tend to waterproof the asphalt surface, preventing damage to its under side from moisture which may rise through the concrete.

If the asphaltic coat is allowed to accumulate in any quantity in a depression such as a heel mark, its location is soon apparent after the placing of asphalt since excess asphaltic cement appears on the surface during rolling. With reasonable sweeping, however, no trouble of this kind has been experienced.

There is a marked difference in the behavior of hot asphaltic mixture under the roller where the paint binder has been used and where it has been omitted. Where concrete has been painted, the asphalt does not move or welt up in front of the roller to any appreciable extent, as is noted when rolling asphalt on plain concrete.

It is found that the asphaltic cement, while dissolved in the distillate, penetrates into the surface of the concrete to a distance of from 1-10 in. to ⅛ in. and in some cases even further. Samples of the surface removed show the concrete adhering uniformly to the asphaltic surface. When removing the sample the concrete is fractured and a layer of solid concrete is removed, carrying the first layer of finer gravel. When trimming a joint to begin a new day's work, the surface of the concrete base is always broken off in removing the thin edge of asphalt which has been cut from the finished work.

For experimental purposes, a few hundred feet of the surface has been placed without the use of the paint binder. As expected, no bond is secured except that of a mechanical nature, due to the roughness of the concrete. Notwithstanding this, the surface remains in first class condition after one month of heavy traffic, and it is believed that good results will be obtained under wear without the use of a binder of any kind. However, the use of this binder at so small an additional cost will improve the pavement and prolong its life to such an extent it will more than justify its expense.

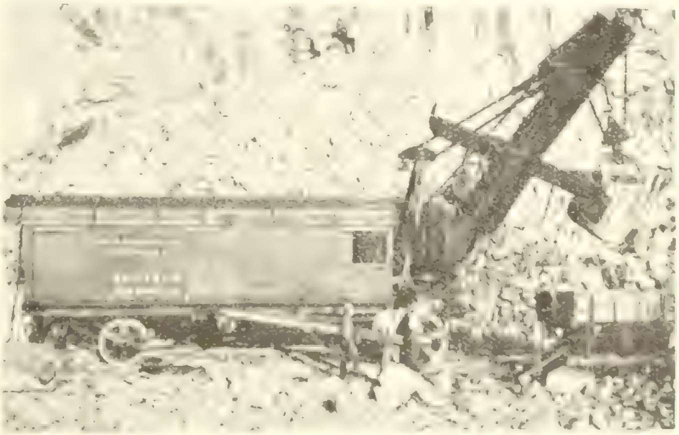
Syenite Rock Plant of The Granite Quarries Ltd., at Deep Cove, Burrard Inlet, B. C.

THE plant of The Granite Quarries, Limited, which is electrically operated, is situate about ten miles north-east along the water-front of Vancouver Harbor. The property consists of about thirty acres of syenite rock, fronting on deep water and extending from water level to a height of about 350 feet at the back boundary of the property with a perpetual water supply and an estimated yardage of 15,000,000 cubic yards of rock above sea level. Every advantage is taken of gravity in laying out the plant, so as to save all possible elevating of material. The upper quarry face extends about 600 feet, with a height varying from 150 feet to 50 feet. The quarry floor is about 100 feet above sea level.

Power for this plant is obtained from the Vancouver Power Company, and is brought into the quarry over 10 miles of pole line with a voltage of 11,000 volts, which is transformed at the quarry to 2200, 440 and 220 volts according to the requirements of the plant. The electric shovel is operated with 440 volt current, and the crushers and air compressor by motors using 2200 volts. The conveyors, hoists, etc., are operated by motors using 220 volts. The 440 volt current is led to the quarry face by armoured cables, which are buried to protect them. At intervals along these are placed potheads for connecting with the shovel. The rock face is broken down by 3-⅛ in. Rand drills, which are operated by air from a 500 ft. compound air compressor installed in the company's power room. Down holes are drilled perpendicularly about 18 feet. These, after being sprung several times to chamber them sufficiently to receive the necessary powder, are loaded with 60 per cent. dynamite and fired by the electric current. Owing to the nature of the rock and the great prevalence of slips the rock breaks very big at times. When this happens pneumatic plugger drills (Canadian Rand automatically rotating—taking ⅞ in. hollow steel) are used to block-hole the larger pieces. These blocks are then broken up again with dynamite. This makes a long bank of broken rock all along the quarry face.

Along this face a 70-ton electric traction 2½-yd. dipper shovel operates. This shovel, which is the latest invention in the shovel line, is operated by electric power, which it receives through flexible cables attached to the protected potheads installed along the quarry floor across the whole face of the quarry. By using traction the expense of frequently moving rails when blasting is eliminated, and the economy of electric power over steam is expected to effect a great saving. Four-yard cars are loaded by the shovel, and using a grade in favor of the load are drawn to the big rock breaker, which has a jaw capacity of 42 in. x 36 in. The cars are then dumped by means of an air hoist. This breaker reduces the rock fed into it to a 5 in. product which falls through a chute and by means of a jig is fed to a 36 in. conveyor belt, 110 ft. long, which carries the product and, after passing up over Grizzly bars set 2 in. apart to screen out the finest material, automatically feeds into a 36 in. x 18 in. jaw crusher. This crusher reduces the rock to about 2½ in. It then falls through a chute into a rotary screen, 5 ft. x 20 ft., through which it is screened and falls direct into the bins. Any over-sized product which is rejected by this screen falls by a chute on to an 18 in. conveyor belt, by which it is brought back and fed into a 20 in. x 10 in. jaw crusher, which is closed up to 1½ in. opening. The product from this crusher, together with all the material which comes from the Grizzly in front of the 36 in. x 18 in. crusher, is elevated by a bucket elevator about 50 ft., where it is passed into a second 5 ft. x 20 ft. rotating screen, from which the screenings drop by chutes into other bins and the rejections are brought back to the 20 in. x 10 in. crusher. The contents of the bins are drawn off by chutes and loaded on scows, which for the purpose of measurement are levelled off by hand and then towed to any of the city bunkers or other market points. The total storage capacity of the crushed rock bunkers at Deep Cove is about 2,500 yards. The rock at the quarry face is exceptionally hard, tough Syenite with no over-load of dirt or gravel. With a view to minimizing the amount of plugger drilling and sledging, exceptionally heavy machinery was installed, as it was found that in hand mucking too much plugging and sledging had to be done. This is all done away with by using the 2½-yd. shovel and big breaker.

East view of plant, showing breaker house with inclined conveyor to main crusher house.

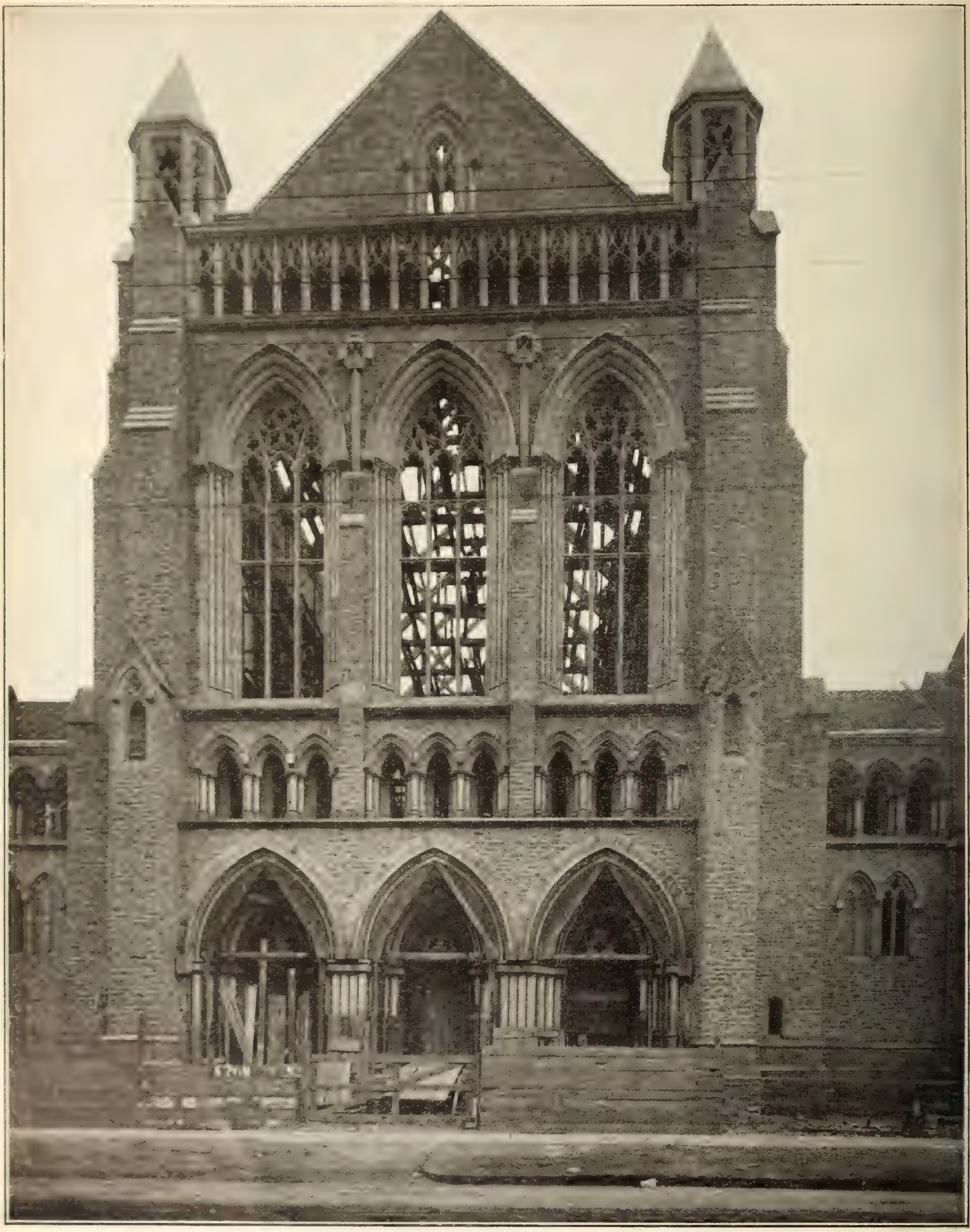


10-ton electric traction shovel, with 2½-yd. dipper.

The capacity of the plant with the installation of this new machinery is 800 cu. yds. of crushed rock in a day of ten hours. Besides the crushed rock plant this company operates on the sea level a lower quarry (immediately below the crushed rock quarry) to supply large fill or rubble rock, which is used considerably throughout the harbor for filling for wharves and retaining walls. This quarried rock, with its sharp angular edges, is found best suited for the work, as it will stand up at a very acute angle and does not slide and spread out in the same manner that weathered natural slide rock does when placed in a fill. It is now operated by hand mucking on to skips at the lower quarry face and swung on to scows by an electric derrick, which can handle about 300 cubic yards a day of ten hours. This will be somewhat altered very shortly by using the electric shovel and dumping off a trestle into a bin, drawing the rock down from the bin through a gate 12 ft. wide and through chutes on to the scows. In this way larger rock can be loaded and a great deal of the hand labor eliminated. As the shovel will handle up to 1,000 yards of rock a day, and will not be monopolized by the crushed rock quarry, it is expected that it can do the mucking for both quarries and save the expense of some eighteen men in the rubble quarry and forty to fifty men in the crushed rock quarry. This rock, when crushed, is unsurpassed for macadam and concrete work. As the material is handled almost entirely by gravity, everything is planned with a view to economy of handling and consequent cheapness of production and being where scows can be loaded direct from the bunkers great economy of transportation is also effected.

A small fleet of scows for transporting the products of the quarries is also maintained by the company. Each of these scows can carry from 350 to 450 cu. yds. of crushed rock, equal to from 400 to 600 tons a scow. Owing to the great abrasive wear of the rock, manganese steel is used wherever practicable. By having the initial crusher of a large jaw capacity and utilizing a shovel for supplying the material to the crushers the cost of handling is greatly reduced and the economy effected in dealing with this class of rock is noteworthy.

According to Mr. C. H. Rust, City Engineer of Victoria, present conditions at the Vancouver Island city are eminently satisfactory. The value of building construction last year was in excess of $8,000,000, and the present year is expected to equal if not surpass that record.



St. Paul's Church, Toronto. North Facade.

Design and Construction of the New St. Paul's Church, Toronto

THE new St. Paul's Anglican Church, now being erected on Bloor street east, Toronto, at an estimated cost of $300,000, presents in its design features of outstanding interest to the technical man and in its construction points of general interest to the layman.

With a view to conveying a general impression of this interesting work and before entering into a detailed description thereof, it may be observed that the building now under construction will provide greater seating accommodation than any other church in Canada with the exception of the Cathedral of Notre Dame in Montreal. As a local comparison: the seating accommodation of St. James' Cathedral is from 1,000 to 1,200, while that of the new St. Paul's Church will be about 2,500—and if the capacity were taxed to the utmost a great many more could be accommodated. The comparison with Notre Dame favors St. Paul's in the respect that the former church has double galleries, while the latter has none.

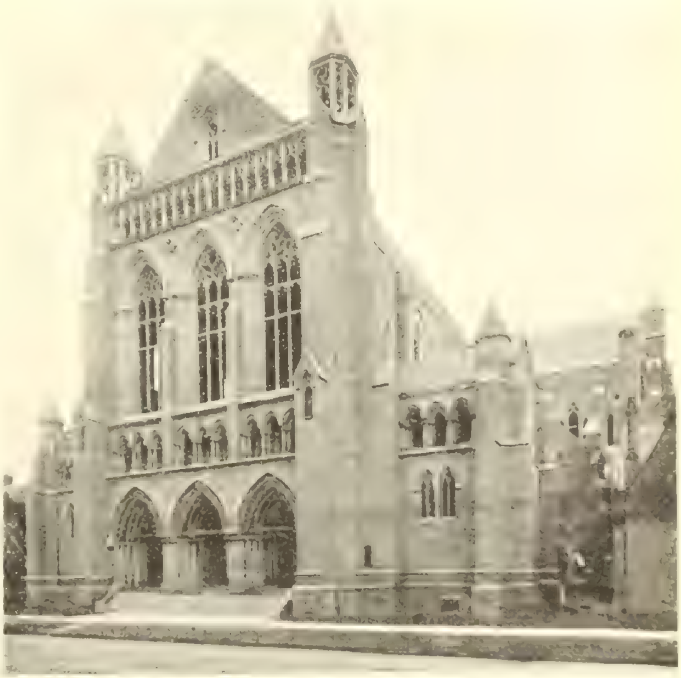
Architecturally, the style of the new building is inspired by the Early English and the Decorated periods of Gothic. This style was adopted to conform with the old church, which will be used as a Sunday School upon the completion of the new structure. The ornamental detail has been carried out with due regard to the magnitude of the church, so that the impression obtained is that the building represents the harmonious adaptation of Gothic to a special problem in design, rather than a slavish adherence to architectural form. The design of the old church is low and somewhat rambling in character; in the new building, necessarily, there is greater height and breadth to accommodate the larger congregation.

On the front facade there are three large entrance doors well impressed with splendidly designed arch mouldings and cut stone tracery heads, all varying in design, above which there is an arcade with pointed arches, supported on isolated columns, extending across the front main and side wing gables. This arcade is decorated with columns and arched mouldings. Above this arcade are three large decorated windows—sometimes called "three-sister gables," constituting an attractive feature. These, also are emphasized with columns and archivolt mouldings, and are filled in with stone mullions and variegated stone tracery. Above these windows is a stone tracery balustrade, set out in relief from the gable, characteristic of the typical cathedral front. Behind the balustrading rises, in plain relief, the main gable. The altitude from the sidewalk to the apex of the gable is 97 feet. The gable is flanked on either side by heavy buttresses, which project about seven feet, terminating at each side of the gable in massive octagonal buttresses, which finish with variegated stone tracery pinnacles. On either side, also, are lower gables designed in harmony with the front gable. The stone-traceried windows and the balustrade, which are exquisitely varied in design, present a feature uncommon and striking in its attractiveness in the front facade.

Another uncommon feature in the new St. Paul's Church is to be a stone-traceried cloister connecting the new church with the old building.

The side elevations, which extend back 235 feet, are emphasized by buttresses and large transepts in harmony with the front elevation—only that the detail is changed by the introduction of large rose windows, 40 feet high and 25 feet wide, which take the place of the triplet windows in the front elevation. There is one of these rose windows in each gable, each showing individuality in design. These are among the largest rose windows in the world. They are made of "Roman Stone," as are all the upper tracery windows, arches and balustrades.

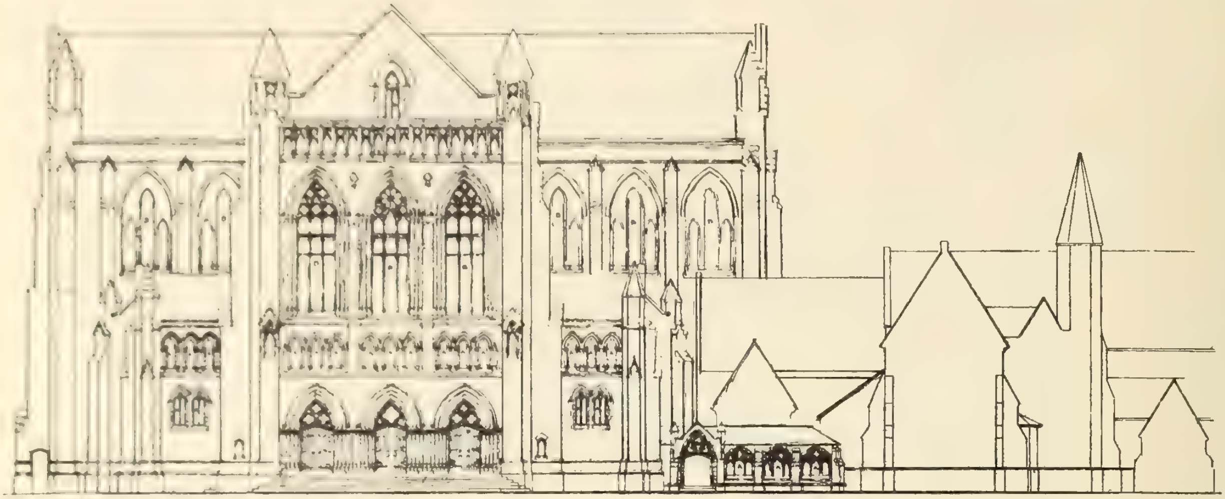
Throughout the whole of the exterior, the church is built of stone, with stone trimmings. No other material is introduced in this part of the construction, the intention being that nothing shall detract from the substantial appearance and solidity of a well-designed Gothic structure. The roof is covered with slate.



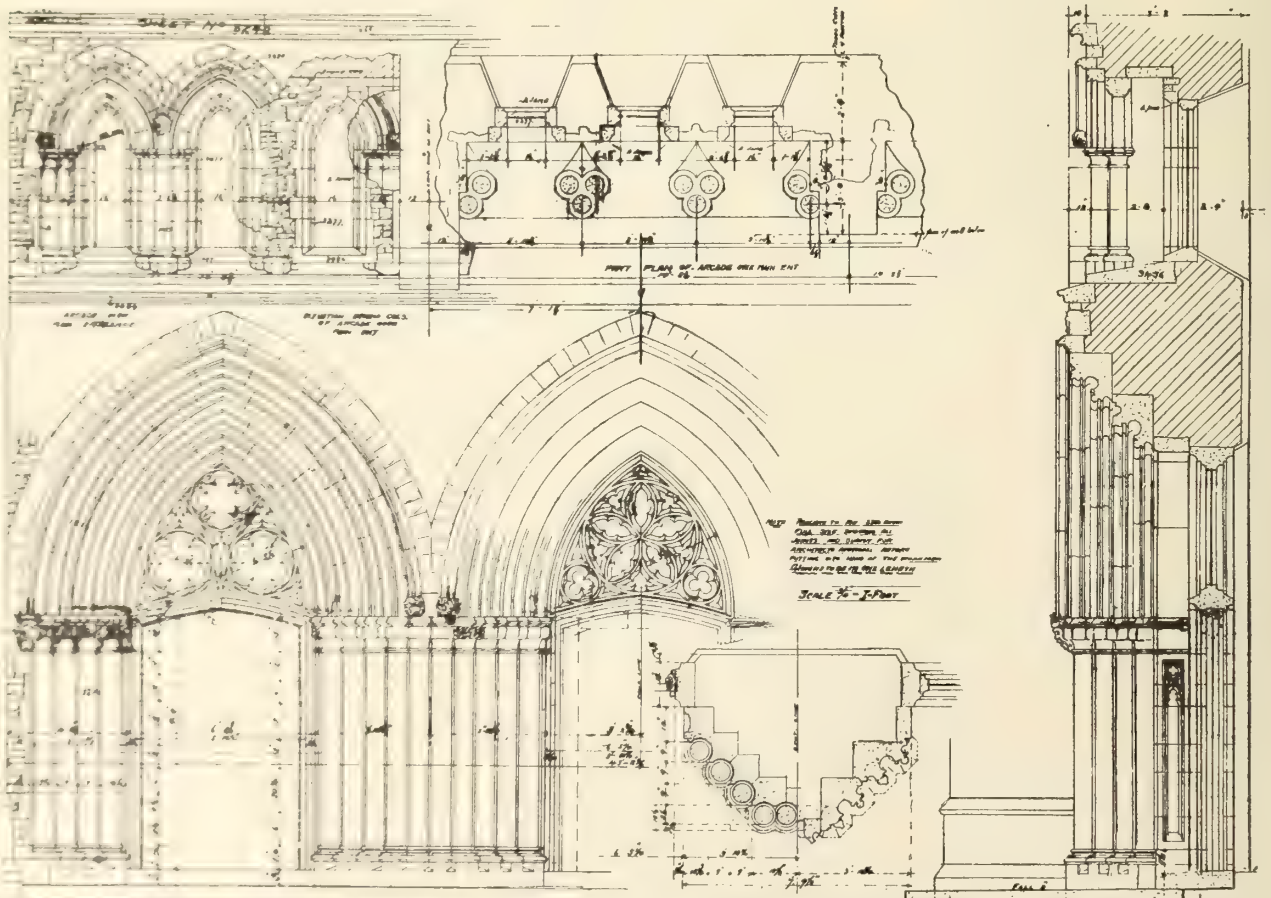
View from northwest.

The interior of the church has been designed after the cathedral style, with a nave, 46 feet wide and 152 feet long, rising up to the apex of the roof 92 feet. These dimensions compare favorably with those of the large cathedrals of England. The chancel is 46 feet wide and 48 feet long, rising to the same height as the nave. The construction of the nave is in the form of stone columns with Gothic arches springing off the same. Above the arches there is a clere-story, which is filled in with groups of stone-traceried windows.

The construction of the chancel conforms with that of the nave, the columns and arches being emphasized by cut-stone shafts and moulded lancet arches. Further emphasis is given to the chancel by an ambulatory formed around it. This is a feature that gen



Front elevation.

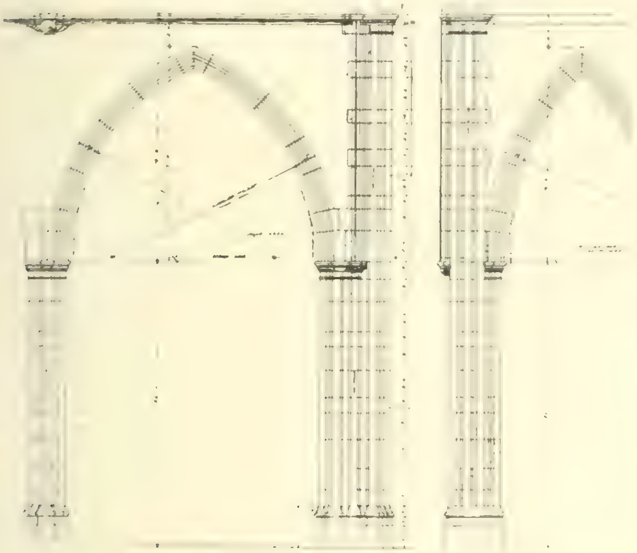


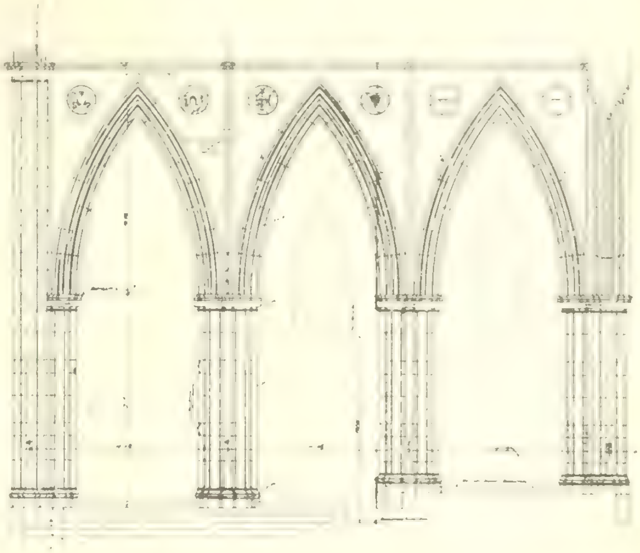
Entrance doors, front elevation.

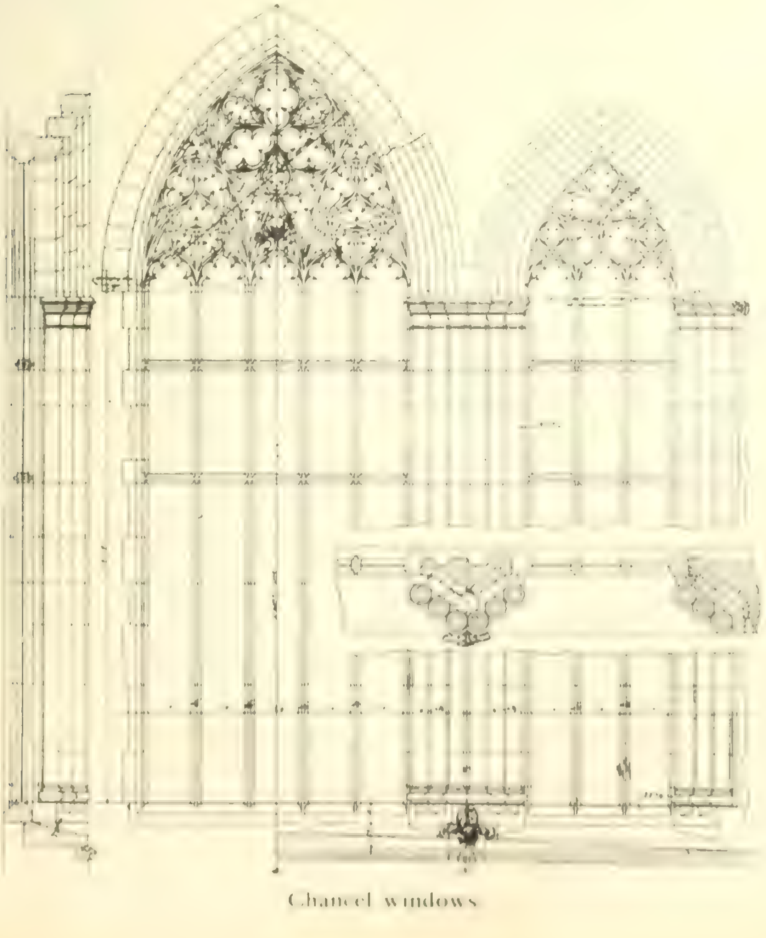
erally pertains to great cathedrals, a form of construction which is practically unknown in Canada and which has been attempted but little on this continent. Extending along both sides of the nave are side aisles arched over to the main walls opposite each column.

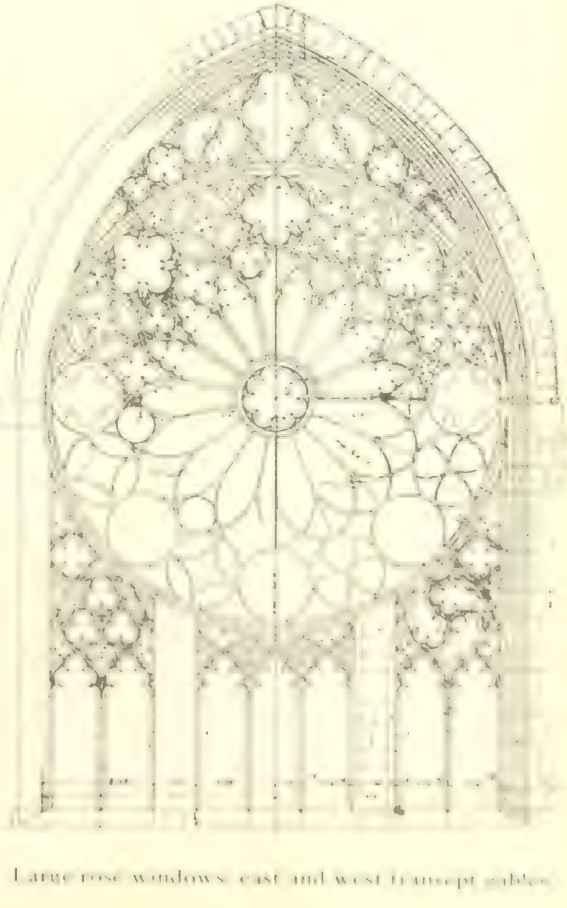
A noteworthy feature has been introduced in a satisfactory solution of the problem of seating the congregation. As the side aisles approach the transepts, they have been widened out into the form of double side aisles, which are also treated with groined stone arches, all opening into the transepts. As a result of this excellent arrangement, two-thirds of the congregation will be distant not more than 70 feet from the pulpit. This feature of the design does not detract in any way from the cathedral-like lines, but rather lends enchantment and interest to the interior.

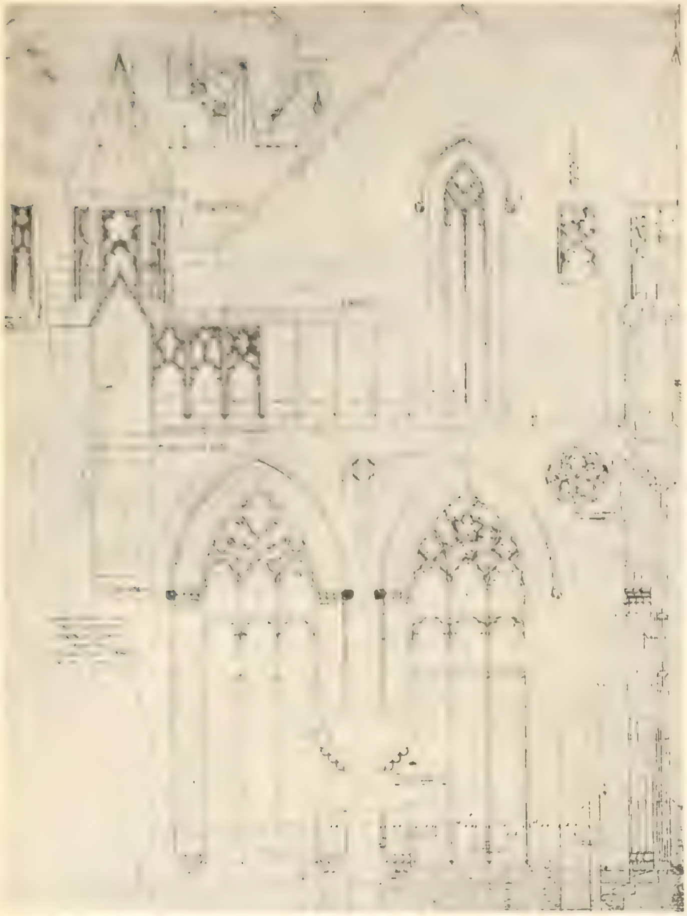
The two large transepts, each of which is 36 feet wide, with an average depth of 42 ft., extend east and west off the main nave and are built after the same style as the nave with side aisle and aisles treated with stone columns and arches of the same altitude. In the side aisles of the transepts there will be installed the great organ, the gift of a member of the congregation and estimated to cost about $35,000. The organ will


Nave and transept arches.


Elevation of chancel piers and arches.


Chancel windows


Large rose windows, east and west transept gables.



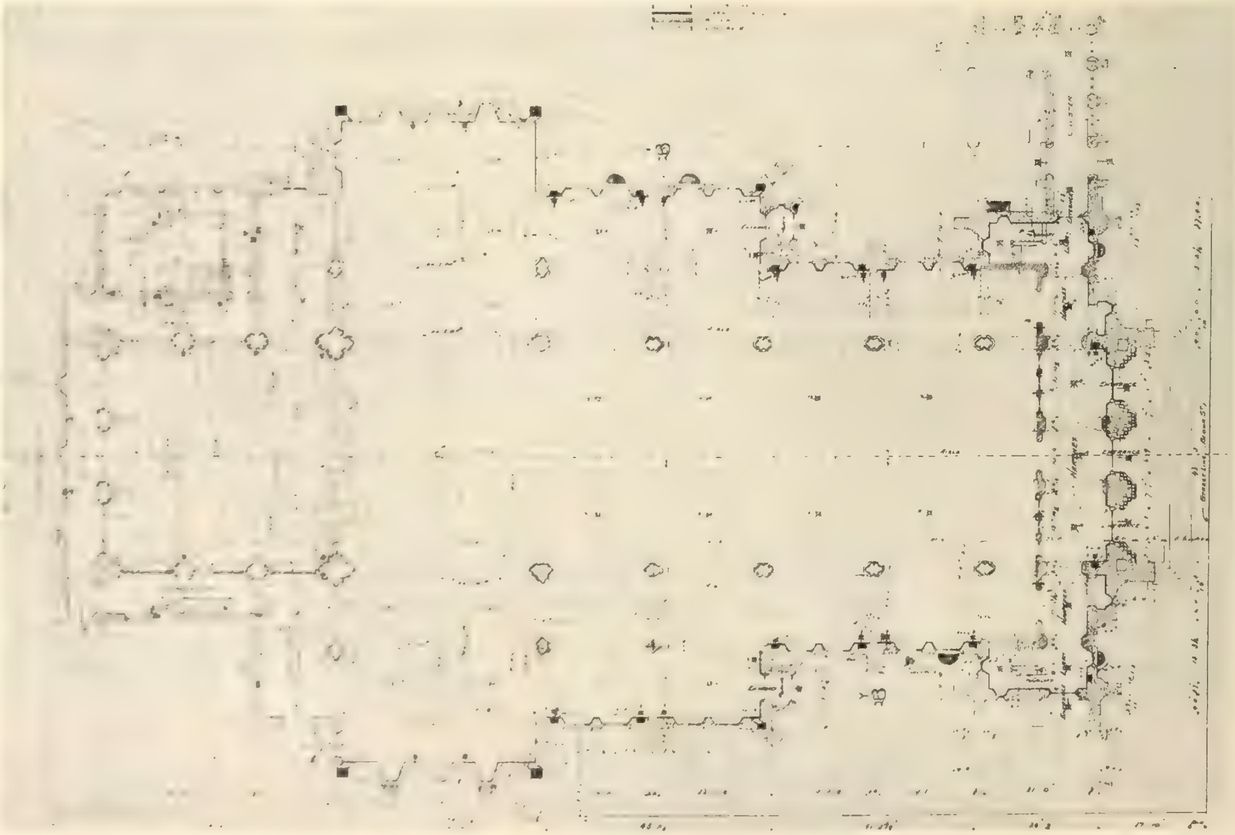
Front gable, showing windows over main entrance.

be built about 18 feet above the main floor of the church. The transepts will rise to the same altitude as the nave of the church. Off the main building, accommodation has been provided for the vestries of the clergy and church-wardens. These vestries are equipped with all modern conveniences.

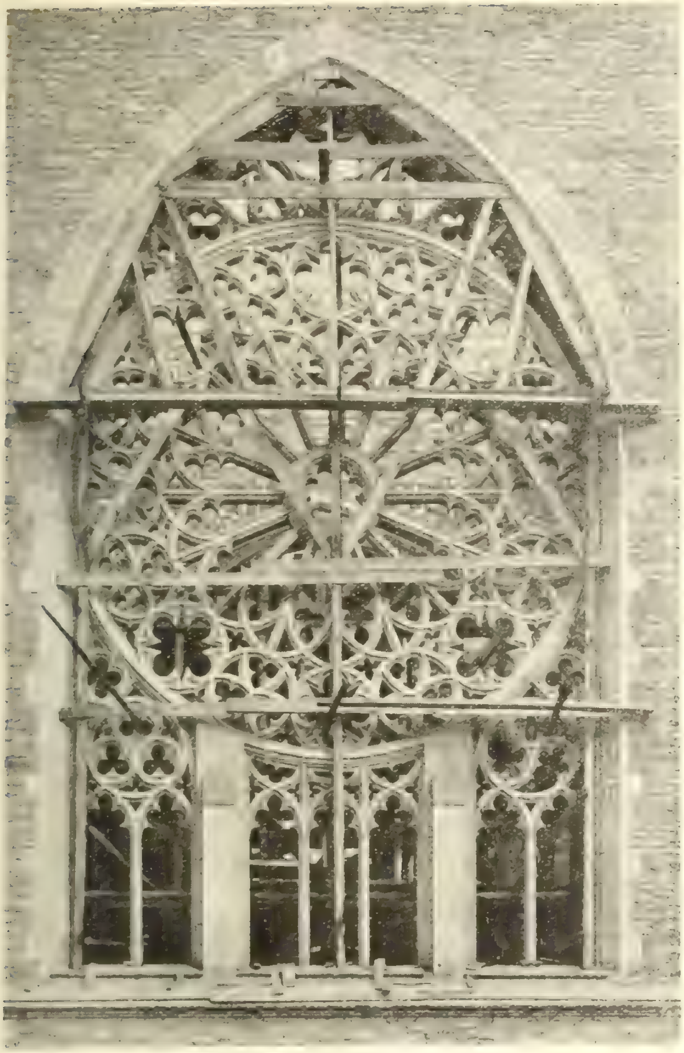
The general impression obtained from the cathedral-like appearance of this building is one of solidity and permanence. Stone trimming is employed throughout, even down to the base of the building. The roof construction adopted by the architect, namely, the open-timbered style, filled in with Gothic tracery forms, presents many advantages and is much truer to church form of building than the too-frequent introduction of plaster-groined ceilings, in imitation of real stone. The architect, we think, has used good judgment in this adaptation.

The precaution that has been taken in making the main floors fireproof not only minimizes the fire risk but again emphasizes the solid effect of the structure. In regard to the flooring of the church, it has not yet been decided whether tile or some other finish is to be used. The chancel, however, will be trimmed with marble work and the floors will be in marble tile.

The church is seated throughout with oak pews, designed on good lines harmonizing with the rest of the interior and suggestive of comfort and endurance. The oak pulpit, which has been designed and constructed in England, will be among the handsomest work of its kind in Canada. So far as the interior finish of the walls is concerned, the plain portions are in stucco-plaster, harmonizing in color with the stone arches and columns. The carved stone bosses and corbels around the nave and chancel represent angels.



Floor plan.



Rose window. East elevation.

The interior of the building is to be lighted by handsome electric chandeliers.

While only the main features of design and construction have been touched upon in the present article, the particulars given will suffice to show that this building will set another and a higher standard of achievement in the ecclesiastical field. No more certain evidence of the progress and prosperity of a community can be adduced than the stability and elaboration of its temples.

In a second article, after the completion of the church, it is hoped to give further details of the interior and equipment.

Mr. E. J. Lennox, 164 Bay street, Toronto, is the architect, and the following is a list of the principal contractors: masonry and cut stone work, Messrs. Walter Page & Company; carpentry work, Mr. Wm. Williamson; plastering, Messrs. Hoidge & Sons; painting and glazing, Mr. A. M. Brown; lead glass work, Mr. R. McCausland; steel work, Dominion Bridge Company; plumbing, Messrs. Keith & Fitzsimmons.

An interesting announcement is that the firm of Messrs. Pilkington Bros., of St. Helens, Eng., the largest glass manufacturing company in the world, have purchased 187 acres at Thorold, Ont., where they will erect a large plant at a cost of more than one million dollars. The first unit of the plant will be built this summer. Three thousand employees will be engaged upon the completion of the plant.

Stresses in a Model Roof Truss

An interesting large-scale experiment was made recently in the laboratories of the University of Manchester (England). It is reported by C. H. Lander, G. Cook, and J. E. Petavel in a paper recently read before the Institution of Civil Engineers. Since ordinary roof trusses have rivetted joints, while stresses are calculated on the basis of frictionless joints, it was decided to measure the stresses in a truss, as a check on the theory. A truss was designed and built for the experiment, exactly like trusses in current use. A truss of 60-ft. span being about the smallest in which the members are proportioned strictly for their stresses (i.e., without excess for stiffness, etc.), this span was adopted. But as this was too large for the facilities available, a model was made on half scale, or 30-ft. span. This was large enough to permit using ordinary rolled shapes and ordinary methods of connection, and therefore did not introduce any "model" condition, or a quality of metal not used in regular practice.

The truss was of the ordinary triangular outline with bracing arranged after the Fink or French type. The roof pitch was 30 deg. The design was made on the following basis: Span, 60 ft.; spacing of trusses, 15 ft.; windload, 26 lb. per sq. ft. normal to the roof; dead-load, 17¼ lb. per sq. ft. of roof surface, excluding trusses; weight of 60-ft. truss, 3,000 lb. (for stress calculation only). The tension members of the truss were made of flat bars, the compression members of pairs of angles for the top chord and single angles for the struts of the web; e.g., the top chord or rafter was made of two angles 2 x 2 x ¼ in. (representing 4 x 4 x ½-in. angles in the 60-ft. truss), while the central panel of the bottom chord or tiebeam was a ⅝ x 3/16 flat bar (representing 14 x ⅜ in.). The joints were made with ⅜-in. bolts, corresponding to ¾-in. rivets in the full-size original. The metal of which the model truss was made was subjected to tensile tests, giving an ultimate strength of 60,000 lb. per sq. in. and a yield-point of 47,000 lb. per sq. in., with elongation 25.8 per cent. in 8 in., and reduction of area 51.8 per cent.

To test the truss, loads were applied by cords attached to individual weighted levers, one cord going to each panel-point. The truss was loaded uniformly at all panel-points in the vertical direction, and normal to the roof on one side to represent wind acting from one side. Stress measurements were made in most of the members. A micrometer gage 3 ft. long between gage-points, stated to be capable of reading to 0.0001-in., was used, with frequent check measurements on a standard bar kept alongside the truss under test. The first extensometer readings were taken at a load corresponding to one-fifth of the calculated ultimate load, and it was assumed that the deformations and stresses in the first one-fifth of total load above this first measurement would have been realized below that measurement, by which means the zero point of measurement was located.

The truss failed at a load slightly above the calculated ultimate load, by the rupture of a tension web member at a stress of nearly 55,000 lb. per sq. in. on the section through the bolt holes. This broken bar was then replaced by a slightly stronger one and the test repeated. At about the same load as the previous load the truss "suddenly failed and the free end jumped off the support [illegible] possibly being caused by temporary buckling of the main rafter."

An important showing of the test was that the plotted curves of stress against load for the different members were in nearly all cases straight lines agreeing closely with the lines derived from calculation. For one or two members, however, the observed curves bent upward sharply near the outer end, i.e., for loads near the ultimate the elongation in such a member increased rapidly, out of all proportion to the load-increase. This occurred in the central part of the bottom chord, and in the upper section of the main tie-diagonal on the windward side. On the other hand some members showed opposite behavior, the elongation curve flattening out near the ultimate load; and the lower sub-tie on the leeward side had no tension throughout the test. These irregularities are not explained, and must be attributed to initial distortions and stresses, and to rigidity of joints. The general result that the stress curves agree closely with those calculated, and that the elongations are linear with the load even up to failure load, is not seriously affected by these minor phenomena.

Initial Stresses in Structural Steel

The character and amount of initial stresses in rolled steel shapes are briefly investigated in a paper recently presented by Mr. J. R. Worcester to the Boston Society of Civil Engineers. The author demonstrates algebraically that a rectangular bar, bent cold, as in straightening, may receive an internal stress up to one-half of its elastic limit. In the case of a 3 x 1-in. bar curved in straightening to a radius of 12 in. the initial stress would amount to about 15,000 lb. per square inch, tension on one edge. This condition involves a tendency to bend out of line, but cannot be detected by ordinary means of inspection. If an axial tensile stress is applied to an internally stressed bar it offsets the tendency to spring and no serious result can occur. If an axial compressive stress is applied, the tendency to spring is very serious and immediately throws the strut out of equilibrium, so that the bad effect of the internal fiber stress is accentuated. If the elastic limit is passed, the buckling may even go on to the point of failure. Mr. Worcester concludes that it is exceedingly important to eliminate as far as possible cold straightening from the shop treatment of metal for compression members.

Those who have considered elevators in buildings as appliances of modern origin may be interested to learn that Professor Boni is reported to have made the discovery that three large lifts were in operation at the Imperial Palace on the Palatine Hill in ancient Rome. While lacking the refinements of mechanism and finish characterising modern elevators, the fact that machinery of the kind was employed is worthy of note as an additional proof of the engineering genius of the Romans. As far back as the first century Roman houses were warmed by hot air proceeding from furnace rooms and circulating beneath the floors and inside the walls. Again, excavations in Pompeii have brought to light a house fitted with well-designed hot and cold water services, arranged very much like those in an essentially modern installation. These and various other examples of ingenuity in early domestic engineering are sufficient to emphasise the point that modern achievements depend mainly upon improved appliances and increased scientific knowledge rather than upon superior intellectual capacity.

Artesian Wells at Regina

THE problem of securing a good supply of water is one that all cities must face some time or another. Western Canadian cities, especially those on the prairies, are no exception in this way. While some of these have an abundant supply of water, many of them are still endeavoring to find the solution. About two years ago, Regina, Saskatchewan's capital city, needed more water badly. The population was growing rapidly, but the supply of water was small, considering the demands. In this connection Mr. R. O. Wynn-Roberts was engaged and after a thorough examination of the surrounding country decided that to secure water from wells was the only means of solving the problem. Accordingly a machine was set to work drilling in the Boggy Creek watershed. When a well had been bored to a depth of 67 feet, an artesian well was struck. The force of the water rushing up through the five-inch pipe was sufficient at the commencement to carry stones with it, but the water gradually resumed its natural flow. Since that time seventeen "gushers" have been struck, the latest of which was located but a week or so ago. One of the gushers located did not reach its rest level at 52 feet. After the pipes had been erected to that height there was still a small flow. The city now has a supply of good water, of about 3,000,000 to 3,500,000 gallons daily, whereas only about one-half that amount is required. Practically all of the Regina gushers were located at depths of from 60 feet to 120 feet.

Well drilling at Regina.

Municipal work is active at Ottawa this year. One of the important projects is the new waterworks pipe line from the Gatineau Hills, seventy miles distant, the estimated cost of which is $5,000,000. Pavements, sidewalks and drains involve the expenditure of $500,000. These figures are interesting when it is considered that the expenditure of the municipal engineering department during the whole of 1912 amounted to less than one and a-quarter million dollars. Ottawa's population in round numbers is now 100,000 and the 1913 assessment nearly $100,000,000.

Vancouver and the Coast Generally

Trade Confidence Restored by Ideal Conditions and a Season of Outstanding Activity—Many Important Projects Announced

Office of The Contract Record,
Vancouver, May 29, 1913.

CONSTRUCTIONAL activity in Vancouver was never more strikingly in evidence than at the present time and the outlook for the immediate future is regarded with a strong feeling of confidence by those actively interested in the development of the city and its adjoining municipalities. Several of the leading architectural firms report a considerable amount of work on hand, and there is every propect that financial arrangements in connection with a number of legitimate building projects of an extensive nature will be concluded satisfactorily within the next few weeks. Recent advices from Victoria, New Westminster and other important points throughout the province state that general business conditions are improving rapidly, thus confirming the impression, prevailing in Vancouver, that the financial situation in this province, at least, is steadily assuming a brighter aspect and providing indications for a vigorous season of constructional activity in the towns of the interior, as well as in the cities at the Coast.

Residential Work Active

A noticeable feature of the report submitted by Building Inspector Neve at a recent meeting of the Point Grey Board of Works of the buildings erected in the municipality during the past twelve months was the number of permits taken out for residences. The building department of the municipality was organized on May 14th, 1912, and during the first year of its existence 587 permits were issued for houses with a total value of $1,995,850. The average cost of the residences built in the municipality is approximately $3,400.

Thirty-two permits were taken out for offices, stores and public buildings, the value of which when completed, was $254,420. For repairs, fifty-eight permits were issued, while the value of the repairing was $22,710. Miscellaneous jobs to the number of 118 were sanctioned by the building department and cost $65,655.

The total number of permits taken out for the year was 795, with a total value of $2,388,635. The building returns so far this year eclipse the records made last year, and show every indication of soaring high above any previous returns.

Progress on Large Buildings

Work is well advanced on the concrete frame of the new office block for the Yorkshire Guarantee & Securities Corporation, Limited, on Seymour street, between Pender and Dunsmuir streets, Vancouver. The exterior facing of this structure, which measures 50 x 120 feet, will be selected pressed brick, trimmed with terra cotta. The entrance lobby will be treated in marble and tile, and the same material will also be used for the stairways and as wainscotting in the corridors. The floors of the banking rooms on the ground floor will be laid in tile with marble baseboards. The counters and office partitions will be of hardwood. The interior equipment throughout will compare favorably with the most elaborately-planned buildings of this type in Western Canada. The Dominion Construction Company has charge of the contract. Messrs. Somervel & Putnam prepared the plans.

Excavation work is now proceeding on the site of the new ten-storey reinforced concrete office building which is to be erected for the Credit Foncier-Franco-Canadian at 837 Hastings street west, Vancouver. While there are no building details at hand available for publication, it has been announced that the structure will be entirely up-to-date, and of an unusually pleasing design architecturally. The cost has been estimated at approximately $350,000. H. L. Stevens & Company are the architects, and the same firm will also have charge of the general contract. Construction work is to proceed immediately the excavating is completed.

The last few weeks witnessed rapid progress on the construction of an extensive building measuring 50 x 120 ft., and four storeys in height, to be used as a garage on Howe street, near the intersection of Beach avenue, Vancouver. It is of reinforced concrete construction throughout, thoroughly fireproof, and will be faced on all four elevations with cement. The concrete frame is now completed to the full height of four storeys, and the remainder of the work will be rushed in order to have the building completed by the end of June. The basement and ground floors will be used for storing automobiles, and the three upper storeys will be occupied by repair shops. A freight elevator of 12,000 lbs. capacity will be installed. This structure contains more floor space than any other garage in the city. A hot water system of heating is to be employed. The cost complete will be in the neighborhood of $60,000. Mr. Wm. Horie, of Messrs. Baynes & Horie, architects, is the owner of this building, which was designed and is being erected under the supervision of his firm.

Mr. Thos. Hooper, Vancouver and Victoria, is the architect for a two-storey building to be used as a branch office by the Royal Bank of Canada, upon which construction is proceeding rapidly at the corner of Seventh avenue and Granville street, Vancouver. It measures 30 x 75 feet and is of fireproof construction, the materials used being granite for the base and above that, Clayburn pressed brick, with appropriate trimmings of terra cotta. The flooring of the entrance vestibule and public banking quarters, on the ground floor, will be terrazzo tile, while the space behind the counters will be floored in oak. The latter material will also be employed as wood finish and for all interior fittings. The upper floor of the building has been planned for offices. The exterior portion is now finished, and work on the interior will be rushed to completion as quickly as possible. Messrs. Purdy and Henderson are handling the general contract. The cost is estimated at approximately $30,000.

Work is well advanced on another branch office similar in design and construction to the building described above, at the corner of Fort and Cook streets, Victoria, for the Royal Bank of Canada. Messrs. Purdy and Henderson are also the contractors for this structure, which has been designed by Mr. Thos. Hooper. The cost will be about $30,000.

Two additional buildings for the Royal Bank of Canada will shortly be completed in the interior of the province, one at Vernon and the other at Fort George. The Vernon branch has been designed along the lines of the Vancouver premises already described, and measures [illegible] feet. It will have a concrete base and walls constructed of pressed brick, trimmed with cement. Fir will be used as interior finish throughout. Rooms for the use of the office staff will be located in the second storey of the building, which is to be two storeys in height. An appropriation of $20,000 has been made for the work. The branch office at Fort George will be housed in a frame structure [illegible] bungalow at an approximate cost of $4,000. Plans for both buildings have been prepared by Mr. Thos. Hooper.

The Dominion Construction Company recently started work on the erection of a moving picture theatre in the 2100 block, Fourth Avenue West, Vancouver. The measurements are 50 x 105 feet, and the construction will be reinforced concrete with front elevation facing of buff pressed brick and side elevations of common red brick. The entrance vestibule, 14 x 25 feet, will be decorated in marble and tile. The interior will be finished in plaster laid on metal lath. The fan system of ventilating will be installed, and the semi-direct lighting method is to be employed for the interior. The cost, when completed, will be about $25,000. Mr. J. Y. McCarter, Vancouver, is the architect.

The Coquitlam Construction Company has now under construction fourteen houses along the east side of Pitt River Road on 12th, 13th and 15th avenues. These are all substantial dwellings of four and five rooms each, equipped with full plumbing, wiring, hot air heating and other conveniences, the cost ranging from $1,500 to $2,000.

Extensive Buildings Planned for Early Construction

It is possible that within the next four weeks contract tenders will be invited for the erection of another huge office block at Vancouver, the location of which is to be on Granville street, near the intersection of Dunsmuir street. The general building plans are in the hands of a local architect, and are well advanced. According to the limited information at hand, the building will measure 120 x 120 feet and will be ten storeys with a tower of five additional storeys. The construction will consist of reinforced concrete, with front exterior facing of pressed brick and tile. The ground floor space will be occupied by stores and the upper storeys will be given over to offices. The specifications call for high speed elevators and an entirely modern equipment throughout. Mr. H. C. Moss, electrical engineer, of Vancouver and Seattle, has plans almost completed for the electrical equipment to be installed.

Construction work is to commence shortly on a six-storey reinforced concrete building for the National Drug & Chemical Company, which will be located in the 800 block on Beatty street, Vancouver, close to the Cambie street bridge. Geo. Snider & Brethour, a local firm, have been awarded the contract for this building, which will measure 100 x 120 feet, and will be entirely fireproof throughout. Mr. H. S. Griffith, of Vancouver and Victoria, prepared the plans. The approximate cost of the structure has not yet been made. This is the third important contract awarded Geo. Snider & Brethour in the course of a week, the others being an eight-room fireproof school structure in West Kitsilano to cost approximately $60,000, and a five-storey club building of reinforced concrete and brick and stone construction, to be erected for the B. C. Electric Railway Company, on the corner of Main and Prior streets, Vancouver, at a cost of approximately $35,000.

Mr. Emil Guenther, architect, recently completed plans for a ten-storey hotel building to be located on Hastings street west, at a point between Seymour and Cambie streets, Vancouver, and tenders for the work will be invited very shortly. The building will be of reinforced concrete construction, thoroughly fireproof, and will be erected at an approximate outlay of $200,000. Pressed brick and tile will be used for the exterior facing.

Plans for a new six-storey hotel building to be erected on Hastings street east, near Campbell avenue, Vancouver, were completed recently by Mr. Emil Guenther, architect. The foundations will provide for four additional storeys when required. The exterior facing is to be of tile and pressed brick, and fir will be used as interior finish. A steam heating system will be installed. The cost will be about $100,000. The same architect has plans under way for the erection of a five-storey brick and mill construction apartment building at a point near the corner of Nelson and Howe streets, Vancouver. It is expected that tenders for this structure will be called for about the middle of June.

A permit was issued recently at Vancouver for the construction of a five-storey, brick and mill construction apartment house, at 852 Nicola street, for Mr. D. B. Foster. The cost of this building has been estimated at approximately $48,000, and it is expected that tenders for the work will be invited within the next few weeks.

Tenders will be invited shortly for a new store and hotel building to be erected on the corner of Sixth street and Second avenue, Prince Rupert, for the Premier Hotel Company of that city. The building will be constructed of brick veneer with stone facing for the first storey and reinforced concrete beams over all the first storey openings. It will occupy a site measuring 50 x 100 feet and will be five storeys in height. Terrazzo tile will be used for the floors of the bar and entrance lobby on the ground floor. In all there will be 80 rooms in the building, fitted with hot and cold running water, telephone and other up-to-date fixtures, and each floor will contain four bathrooms. Fir is to be employed as interior finish throughout. A steam heating plant will be installed in the basement. The cost of this structure complete will be approximately $50,000. Mr. W. P. White, Vancouver, is the architect.

False Creek Dredging Under Way

Work on the contract of dredging False Creek from English Bay to Main street bridge, awarded recently by the Dominion Government to the Pacific Dredging Company, Limited, Vancouver, was started at the middle of May. According to the government estimate, there are 3,300,000 cubic yards of material to be dredged in order to make the channel twenty feet deep, at low tide, and 250 feet wide. While no definite arrangements have yet been made in regard to the disposal of the material dredged, for a time at least it will be pumped into the head of the creek. The dredge "Robson" and No. 1, which are now engaged in the work, are of the hydraulic variety, and a third dredge, which will be put to work early in June, is of the type known as a dipper dredge, which scoops up to bottom after the other dredges have completed their work by suction, acting as a sort of cleaner or sweeper on the harder formation laid bare by the hydraulic dredges. The dredges Robson and No. 1 have a capacity respectively of 5,000 and 4,000 cubic yards a day, while the dipper dredge has a daily capacity of 2,500 cubic yards.

The work is being carried on uninterruptedly, night and day, with the exception of Sundays. A force of sixty men is employed at present, and this number will be increased upon the arrival of the third dredge. The only delays in the work will be the cleaning out of the long suction pipes which, in the case of the No. 1 dredge, are 5,000 feet in length, and in the case of the Robson, 4,000 feet.

The News from Victoria

Recent advices from Victoria would indicate that an early start is to be made on the erection of a large departmental store for the Hudson's Bay Company at the corner of Fishguard and Douglas streets. This site has been purchased by the company for a consideration of $250,000. It comprises a frontage of 240 feet on Douglas, 120 feet on Fishguard, and 120 feet frontage on Herald street. It is understood that the new building for Victoria will be designed along the lines of the company's Vancouver and Calgary premises. Messrs. Burke, Horwood & White, of Toronto, have the plans in course of preparation.

Construction work was commenced recently by Mr. Martin Jones, contractor, on a three-storey brick store and warehouse building at the corner of Store and Cormorant streets, Victoria, for which Mr. M. S. Farwell is the architect. The building will be erected on a foundation strong enough to carry two extra storeys. The cost will be about $30,000.

Mr. Jesse M. Warren, architect, Victoria, has nearly completed plans for an eight-storey hotel building on Broad street, upon which construction will start in the near future. Only five storeys will be proceeded with at present at an approximate cost of $40,000. The structure will be of reinforced concrete construction, with front exterior facing of pressed brick and terra cotta. One high speed elevator will be installed and the building will be heated by steam. Adams Bros., Victoria, are the owners.

An important deal in inside realty was consummated at Victoria recently when the Imperial Bank of Canada purchased a site at the corner of Government and Yates streets on which it is intended to erect a bank block of imposing dimensions in the near future.

Coquitlam Dam Nearing Completion.

The great dam of the British Columbia Electric Railway Company at Lake Coquitlam will probably be completed in June, this being in advance of expectations. It will be 98 feet in height, 600 feet wide at the base, 850 feet long and 40 feet wide on the crest. In the construction, 1,055,000 cubic yards of material will be handled. The storage capacity of the dam will be 7,404,000,000 cubic feet, giving a reserve supply during the dry season of over 53,700,000 kw.h. of electric energy.

The water supply of New Westminster is taken from Lake Coquitlam. The provisions made by the company to preserve the purity of this supply has entailed an expenditure of nearly $1,000,000 this amount covering clearing about the lake, erection of new water works intake, etc.

Mr. J. R. Freeman, the engineer who is representing the Dominion Government in connection with the erection of the great dam, made an inspection of the work recently. While on the Pacific Coast he stated that Mr. G. R. G. Conway, chief engineer of the B. C. Electric Railway Company, had co-operated with him in every possible way, and as a result the dam would be one of the safest in the world. Through the courtesy of the company, about fifty members of the Vancouver Branch of the Canadian Society of Civil Engineers recently paid a visit to the scene of operations and were shown over the work by the chief engineer and Mr. Ransom, resident engineer.

An Interesting Paper

"Some Public Works and Explorations in B. C. since 1880," was the subject of a recent paper read before the Vancouver Branch of the Canadian Society of Civil Engineers by Mr. F. C. Gamble, chairman of the Victoria Branch of the Society. Mr. Gamble said that in 1880 Vancouver was unknown, and Victoria was incorporated only as a village. The Dominion drydock at Esquimalt was at that time in the process of erection. In that year the Dominion Government expended in public improvements, exclusive of telegraph, railways and public buildings, an amount less than $30,000. In the present year there will be spent for the same purposes in this province by the Dominion, $1,750,000. The lecturer detailed some of the development work which had taken place in the harbor of Victoria, together with a description of the engineering work in the vicinity of Windermere.

Victoria Architects Elect Officers

At the annual meeting of the Victoria Chapter of the British Columbia Society of Architects held recently officers were elected as follows: President, Mr. J. C. M. Keith; Vice-President, Mr. Ridgway Wilson. Council: Messrs. James Cullin, Butler, Rose and Spurgeon; Secretary-Treasurer, Mr. N. Reid. The first two mentioned officials were re-elected. It was shown that the organization had grown in numbers and in influence during the past year, having sixty-two full members, twenty-five associate members and five student members.

From the Saskatchewan Capital

WHILE the financial situation at Regina has shown but slight improvement up to the present time, building operations are proceeding well, the figure to date exceeding by far the corresponding period of last year. One noticeable feature of this year's building is that the structures to be erected by the Grand Trunk Pacific Railway will cost almost as much as the entire building programme carried out in the city in 1910, which amounted to $2,351,000. It is estimated that the Grand Trunk Pacific programme will not fall far short of that amount. Since 1910, however, Regina's building progress has been phenomenal, amounting to over $5,000,000 in 1911 and $8,047,000 in 1912.

The Presbyterians of Regina have sufficient money promised to warrant the erection of the $1,000,000 college proposed, and it is now expected that the construction of this large structure will be commenced shortly. The plans are being prepared.

Construction work on the new city power house in Lakeview is to commence immediately. The excavation, fittings, basement and all constructional work up to the first floor will be done by day labor. Tenders for the remainder of the building will be called while the sub-structure is in course of construction. This building will be entirely fireproof. The floor area will measure 174 feet by 120 feet, exclusive of additions. Provision is made for a large number of boilers with self-feeding hoppers of the latest design. In the excavation, 17,000 yards of soil will be removed.

The fire, light and power committee of Regina has let contracts for some of the equipment for the power house, involving an expenditure of $34,880. This sum will provide six sections of economizers which will be purchased from the B. F. Sturtevant Company at a cost of $15,720, and a Peebles motor converter and switchboard, costing $19,160 from Roper, Clark & Company. Each section of the economizers consists of 160 twelve-foot tubes complete with all safety and blow-off valves and soot pit doors for each section.

The Egon Von Pappa Company, negotiating for a site at Regina for a brick plant, have agreed to sell brick at $11.50 per thousand in the event of their securing a site. The company will erect a building at a cost of $20,000 and install machinery at a cost of $80,000. The application will be dealt with finally during the next week.

Under a contract just awarded by the Federal Government, the Marconi Company of Canada, will erect two wireless stations at the terminals of the proposed Hudson Bay Railway—one at Port Nelson, on the Hudson Bay, the northern terminal of the line, and the other at Le Pas, Manitoba, the connecting point of the new line with the Government railway system. The stations will play an important part in the construction of the Hudson Bay railway, as they are primarily intended to serve as intermediaries for the ordering and forwarding of material, etc., from the base to the scene of operations. During nine months in the year Port Nelson is cut off from Ottawa, but with the erection of the wireless stations the work of the officials at Ottawa will be greatly facilitated. The stations will be of 10 kw., the power for which will be obtained from 20 h.p. Canadian Fairbanks-Morse engines, each station having a range of 500 miles. The manager of the Marconi Company is Mr. J. H. Laner, late secretary of the Montreal [illegible] Exchange.

Building at Calgary Well-Maintained

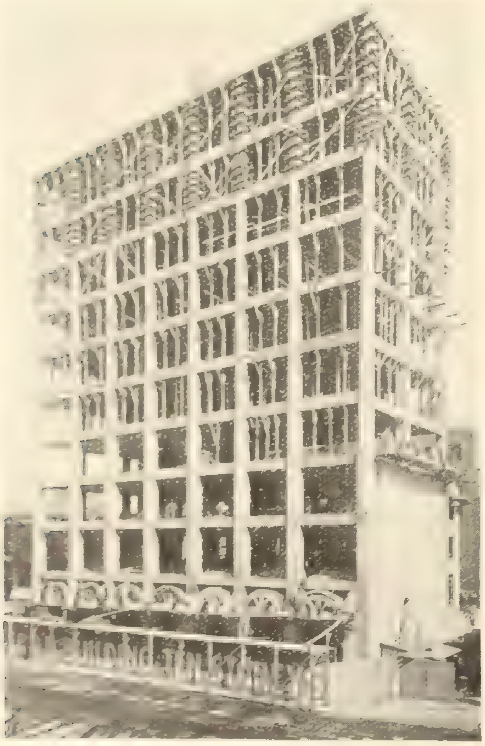
Improved Financial Conditions Strengthen the Situation for the Constructional Interests Progress Reports on the Larger Undertakings

Correspondence of the Contract Record

Calgary, May 29, 1913.

FINANCIAL conditions have improved of late and the building trades have at once responded to the change. The volume of building during the last few months has been, if anything, larger than that of the corresponding season of last year, since there have been many contracts under way which were reported in the building permits of last year. Those who attended the last meeting of the National Association of Builders' Exchanges will bear witness to the fact that there was a very brisk movement in building construction during the month of February, in spite of weather conditions. Satisfactory progress has been made on the large buildings under construction, particularly on the C. P. R. hotel, the Hudson's Bay store, the Herald Building and other large office structures, besides the numerous warehouses.

The Herald Building



Herald Building, Calgary, under construction.

Of the larger buildings in the city, the progress on the building for the Herald Publishing Company, Limited, has attracted the most attention. The contractors, Messrs. Fyshe, McNeill, Martin, Trainer, Limited, have made rapid strides in the construction of the reinforced concrete skeleton of this ten-storey office building and have completed the placing of all the 4,700 cubic yards of concrete and the 320 tons of reinforcing steel required. Today the exterior is practically entirely faced with bricks and presents a very pleasing appearance. The street elevations are faced with tapestry bricks and terra cotta trimmings, all in a soft brown color. The alleys and light-well facings are of hollow brick, harmonizing well with the fronts. There were used in the construction of this building 215,000 tapestry brick, 475,000 common brick and 115,000 hollow brick. Partitions have already been erected on several of the lower floors and the various trades are entering the building to complete the finish. Messrs. H. Kelly & Company, Limited, who have the contract for the plumbing and heating, have the boilers installed, besides having the roughing-in for the first few floors well under way. The architects are Messrs. Brown & Vallance, of Montreal, for whom Mr. E. M. H. Herchall is the local representative in charge of their work.

New Buildings for Calgary Furniture Stores and The Hudson's Bay Company

The same contractors have under construction the new warehouse and store building for the Calgary Furniture Stores, Limited, opposite the Herald Building, and the new Hudson's Bay store. This will be a six-storey, reinforced concrete building, 130 by 100 feet, with an exterior of brick and terra cotta. There will be two entrances on First street west and another on Seventh avenue. The ground floor will be used as a show room and the upper floors for storage. There will be four passenger elevators and one freight elevator. The trim throughout will be of white quartered oak. All the floors will be of maple hardwood and all the windows of rolled steel sections. The building will be steam heated, with electric lights, and will have the vacuum cleaning system throughout. The Turner Mushroom System is being used in the construction of this building. The interior columns are all spaced 18 ft. 6 in. by 20 ft. 2 in. on centres, and the flat slabs all 7½ in. and 8 in. thick. In the showroom, where the columns are 21 ft. long, all the columns are circular, whereas above, they are all octagonal, with the flaring head characteristic of this system. In general, the reinforcing steel is laid in bands of 14⅜ in. round rods, spaced according to the spans. The contractors have built their own gravity system for the distribution of the concrete, using a wooden hoisting tower from which the concrete is distributed by a U-shaped chute. The chute is supported by a trussed timber boom fixed to the side of the tower, as in most of these systems. A two-bag gravity mixer is used for mixing the concrete. The contractors state that the system is capable of depositing 400 yards of concrete per ten hour day. In this building 3,800 cubic yards of concrete will be required. Of this amount about 2,500 yards have been placed. The contractors have been using screened gravel, furnished by H. L. Fridenberg, who also supplied the same class of gravel for the concrete in the Herald Building. Nearly 300 tons of reinforcing steel will be used. The lumber for the forms will have been used about twice during the completion of the concreting. The cost of the building is estimated at $325,000. The architects are Messrs. Brown & Vallance, of Montreal.

Messrs. McDougall & Forster, Limited, of Calgary and Edmonton, have the contract for a six-storey office building on 7th ave. for Mr. A. C. Johnson, of this city. The cost is estimated at $190,000. The building will have a frontage of 50 feet and will be 130 feet deep, with the street front of terra cotta. The construction will be of the steel cage type, fireproofed throughout, with reinforced concrete floors and "Pyrobar" partitions. Some 250 tons of structural steel are being supplied by the Hamilton Bridge Company, Limited, the contractors doing their own erection. Mr. Alex. Pirie, of Calgary, is the architect. Jones & Lyttle, Limited, of Calgary, have the contract for the completion of the 10-storey Lancaster Building, described recently in these pages. The contract will amount to $350,000. The architect is Mr. James C. Teague, of Calgary. The same contractors have about completed the construction of a large warehouse (estimated to cost $170,000) for the Cockshutt Plow Company, Limited. The architects are Messrs. Lawson & Fordyce, of Calgary.

From a recent photo of the C.P.R. hotel, Calgary, now nearing completion.

The Union Building Company, Limited, have commenced construction on the warehouse for Massey-Harris & Company, Limited, estimated to cost $130,000. Messrs. Carter-Halls-Aldinger, Limited, of Winnipeg, have the contracts for the construction of warehouses for the Canadian General Electric Company, Limited, and the Sherwin, Williams & Company, Limited. Mr. R. A. Brocklebank has the contract for the construction of the first of the new 15-room schools for the Calgary Public Protestant School Board, for the sum of $163,000. This school will be of reinforced concrete construction, with solid brick interior bearing walls, and will have a cut stone exterior. The contract for the fireproof addition to the Holy Cross Hospital has been let to Doyle, Thomas & Christensen, Limited, of Calgary and Edmonton.

Westinghouse, Church, Kerr & Company, builders of the Canadian Pacific Railway car shops in this city, have under construction a large brass foundry building in East Calgary for the North-West Foundry Company. The foundry building will be of the usual type—a building 200 feet long, the main area being 29 feet high for the crane runway, and with lower wings 16 feet high in the clear, making a total width of 100 feet. The entire construction will be of reinforced concrete, with steel sash filling the panels between columns and beams. The concrete is being deposited by means of an Insley patented gravity system of distribution, there being 3,000 cubic yards of concrete and 130 tons of reinforcing steel required. The construction is typical, the main columns being spaced 25 feet apart in the length of the building. The roof will be a 4-in. slab covered with a 5-ply tar and gravel roof, carried on beams 6 ft. 3 in. on centers, with a clear span of 27 feet. These beams are 10 in. wide and 25 in. deep, reinforced with 2-1⅛ in. and 1-1 in. square twisted steel bars, and with ½-in. stirrups. There will be installed all the necessary mechanical equipment to care for the production of seven brass foundries, necessitating as many as eight steel stacks, the largest being for the boilers, 28 in. in diameter, and 66 ft. above the roof line. The final cost will be about $175,000.

Calgary Trade News

Messrs. Fyshe, McNeill, Martin and Trainer Limited, report the concreting to be completed on the new warehouses for the Calgary Paint & Glass Company and the Northern Electric and Manufacturing Company.

Messrs. J. McDiarmid & Company are concreting the footings and placing steel grillages for the steel on the new half million dollar Examining warehouse here for the Dominion Government.

Mr. Peterson, local manager of the Kahn System, reports that their system is specified in the following Calgary buildings: Messrs. Pilkington Bros.' new warehouse, the North-West Commercial Travellers' Association Building, the public schools and the Allen moving picture theatre; also in the Tegler building, Northern Club, King Edward school and Westmount school at Edmonton and the city hall at Macleod.

Mr. James C. Teague has now completed plans and specifications for a new moving picture theatre to be erected by the Canadian Film Exchange. The building will be two storeys high and will have gravel roof with reinforced concrete floors, steam heating, plumbing and electric wiring, with footings provided for a ten-storey structure at a cost of $100,000.

Messrs. Hubbell & Kelly have plans out for a new motion picture theatre on First Street West for Dr. N. J. Lindsay. The approximate cost is to be $20,000. A new office and store block at a cost of $40,000 will be erected by Mr. A. Allan on the site opposite the Department of Natural Resources of the Canadian Pacific Railway, where the old building was burned down last month. Messrs. Archer & Robertson are building two new office blocks on Eighth Avenue West. Messrs. J. K. Lee & Company are erecting a new office block on Eighth Avenue West.

Mr. Foulds has just installed new equipment for the purpose of manufacturing hollow metal sash and has secured the order to supply the steel sash for the new British America Paint Company's building in Edmonton.

Messrs. Johnston & Johnston have the contract to build the new testing laboratory for the city of Calgary.

Mr. W. J. Maurer, brick contractor, late of Denver, Col., has now opened an office in Calgary.

Montreal Filtration Plant Subject of Dispute

There is more trouble over the Montreal filtration plant, Verdun, now being constructed by Mr. Norman M. McLeod from designs by Messrs. Hering and Fuller, of New York. Mr. McLeod took over the contract from Mr. F. H. McGregor in 1912, and during the winter a portion of the plant was severely damaged by frost, to the extent of about $35,000, and this the contractor has been asked to make good. Mr. McLeod has now served a notarial protest on the city, alleging that the plans are faulty inasmuch as the ground is unsuitable for such a plant. This allegation he backs up by the reports of four engineers, Messrs. H. Holgate, W. J. Francis, M. J. Butler, and Ernest Marceau, which were made independently. The soil is described as a sort of quicksand, and the engineers are emphatic in their declarations as to its unsuitableness. The contractor, in his protest, states "that in the judgment of the engineers who had been consulted, the disturbance due to frost was a minor matter compared to the subsidence of practically the entire outside walls and [illegible] parts of the structure [illegible] were appreciable, such subsidence indicating that the structural design of the plant was [illegible] bearing power of the soil." Mr. McLeod declines any liability for the failure of the structure, as the city refuses to make certain alterations.

For the city and Messrs. Hering and Fuller, it is strenuously denied that the soil is unsuitable and that the design is faulty. Prior to the drawing of the plans pit tests were made, and during the progress of the work investigations showed that the soil had sufficient bearing power. The works throughout, it is said, are designed in accordance with the best modern practice, and in accordance with standards which have been found satisfactory not only in the United States, but also in Canada. The damage, it is contended, is due to the contractor not properly protecting the work during the winter. Mr. Lesage, the superintendent of the waterworks, points out that several heavy buildings, some 50 years old, are erected on soil of the same character. He suggests that the examinations by engineers on behalf of Mr. McLeod, were made at a time when the soil, after extraordinary weather conditions during the past winter, was soft and in a half oozy state. Upheavals were bound to disturb the concrete floors, which had not been properly protected.

City Planning Conference at Chicago

The Fifth International Conference on City Planning, held in Chicago last month, was attended by official representatives of twenty-two States of the Union and six Canadian Provinces. There were five delegates from Montreal, ten from Toronto, two from Calgary and one each from Regina, Ottawa and Winnipeg. The chairman of the conference was Mr. F. L. Olmstead, of Brookline, Mass., who prophesied that in fifty years every city would possess an official body to which would be assigned the responsibility of carrying out a consistent building plan. On the second day of the conference, when the proceedings were presided over by Mr. Lawson Purdy, of New York City, an interesting paper was read by Mr. V. G. Bogue, of Vancouver, on the subject of a City Planning Survey. Other papers read were: "The Legal Aspect of City Planning," by Mr. E. M. Bassett, member of the Public Service Commission of New York City; "The Organization and Functions of a City Planning Commission," by W. A. Magee, Mayor of Pittsburgh, Pa.; "The Parks of Kansas City," by Geo. E. Kessler, landscape architect, St. Louis.

C.P.R. Active at Winnipeg

Great activity in construction work is now in evidence all over the Canadian Pacific Railway Winnipeg terminals, and nearly 3,000 laborers are employed in the various undertakings at present under way. The Union Stock Yards, it is expected, will be completed by Dominion Day. At Transcona the erection of the roundhouse is nearly completed and accommodations for fifty-five engines at one time, is being provided for. Further accommodation for no less a number of engines will, in the future, be built, but no arrangements have yet been made in this direction, although the site of a new roundhouse has been preserved. Here also the shops for the execution of minor repairs are in a fair way to completion. The yards in connection with the Canadian Pacific Railway grain elevators and the switching generally, which was announced to contain 112 miles of track, are nearing completion, about forty-five miles of track having already been laid. The ballasting on the hump track is likely soon to be ready, and this will allow the automatic switching of cars. By this arrangement the cars can be distributed to the tracks desired, by running down an inclined plane without the necessity of an engine, once they are started on their way. On the Kildman cut-off and the bridge there, great progress is being made. The bridge itself is to be a double span swing bridge, and construction work has been carried on to the east end of the new bridge. Only about 300 feet of trackage remains to be built from the west end of the structure to connect up and complete the cutoff.

Personal Mention

Mr. T. Kennard Thompson, consulting engineer, has been re-elected president of the Canadian Club of New York.

Mr. D. McD. Campbell, who has been City Engineer of Sydney, N.S., since 1908, has resigned to engage in private practice.

Mr. Collingwood Schriber, the veteran railroad engineer, arrived recently at Vancouver after a trip across country in which he made careful observations of G. T. P. construction.

Mr. A. W. Gray, Toronto, has been appointed Commissioner for the Parks Branch of the Department of the Interior at Ottawa. His headquarters will be at Edmonton, Alta.

Mr. A. T. Enlow, former manager of sales for the Stock Rolling Mill Company, Canton, Ohio, has resigned to become associated with the Pedlar Metal Roofing Company, Oshawa, Ont.

City Engineer Campbell, Sydney, N.S., who is going into private practice.

Dr. Rudolph Hering, New York City, visited Toronto on May 28th and in company with Mr. Roland Harris, Works Commissioner, and Mr. G. G. Powell, City Engineer, paid a visit of inspection to the sewage disposal plant at Morley avenue.

Mr. H. N. Ruttan, City Engineer of Winnipeg, has been elected a member of the Council of the Institution of Civil Engineers, London, Eng. Mr. Ruttan is the only Canadian upon the council of the oldest and most honorable engineering body in the world.

Mr. G. L. Mattice, M.Can.Soc.C.E., recently Assistant District Engineer of the National Transcontinental Railway of Canada, has been appointed District Engineer of the North Railway Company, with headquarters in the Canadian Express Building, Montreal, Que.

Mr. Henry J. Fuller, president of the Canadian Fairbanks Morse Company, has been elected vice-president of Fairbanks, Morse & Company with charge of the eastern business of the company, and headquarters in New York. Mr. Fuller will continue as president of the Canadian company, giving it his first consideration, and spending considerable time in Montreal.

Mr. W. F. Graves has been appointed chief engineer of the Montreal Tramways Company. Mr. Graves has had a wide experience in civil engineering work and has been connected with several United States railways as engineer of maintenance of way and engineer of construction. He has given up the appointment of superintendent of track of the Chicago City Railway Company to become connected with the Montreal Tramways Company. Mr. Graves is a member of the American Society of Civil Engineers, the Traffic Club of Chicago, and the Chicago Engineers' Club.

Mr. N. E. Brooks, M. Can. Soc. C. E., formerly Division Engineer of the Alberta division of the Canadian Pacific Railway, at Calgary, Alta., and several times Acting General Superintendent of the division, has been promoted to be Engineer of Maintenance-of-way of the western lines. Mr. Brooks was born at Sherbrooke, Que., in 1866. His engineering experience began in 1887 as a chainman with the Canadian Pacific Railway. Later he was promoted to be rodman and Resident Engineer on construction of the Atlantic & Northwest branch. From 1889 to 1893 he was transitman and Resident Engineer on surveys and construction of the Calgary & Edmonton and MacLeod & Crows Nest branches. For the following 10 years he was representative of the bondholders in connection with the Calgary & Edmonton branch, with headquarters at Calgary. In 1903 he was appointed Division Engineer of the western division, and in 1910 he was appointed to the same position on the Alberta division.

Mainly Constructional

The News in Brief—From Coast to Coast

At Winnipeg, Man., the building permits issued to date represent in round figures a total of seven million dollars.

Mr. A. H. Wagstaff, Greenwood, avenue, Toronto, will establish a new brick plant at Scarborough, where he has bought a 100-acre property.

Building construction is particularly active at Victoria. Three local contractors are carrying out work involving the expenditure of some $600,000.

At the suggestion of the Montreal Board of Control, the Council have agreed to allow the Tramways Company to haul freight until further notice.

Mr. E. M. Statler, head of the Statler hotels at Buffalo and Cleveland, confirms the report that his company will erect at Toronto one of the most commodious hotels on the continent.

Toronto Clay Products, Limited, has secured letters of incorporation. The capital is $300,000 and the provisional directors are Messrs. J. B. Ferguson, C. J. Quarrington and G. F. Dewitt.

Plans have been completed for the proposed ten-storey building of the Dominion Bank, to be erected at the corner of King and Yonge streets, Toronto, at an estimated cost of one million dollars.

The Dominion Government is considering the expenditure of one million dollars for the new Q. O. R. armoury to be erected on a 20-acre site at [illegible] donated to the regiment by Sir Henry Pellatt.

Over half a million dollars is the estimated cost of the new Customs House at Ottawa, the excavation upon which is well advanced. The Government has voted $150,000 for improvements at Rideau Hall, Ottawa.

Messrs. W. M. McGrenere, M.P. McDonagh and F. Snell are named as the provisional directors of the McGrenere Brick & Tile Company, Limited, incorporated at London, Ont., with a capital of $40,000.

The city of Quebec is the head office of the newly incorporated Rimouski Brick & Terra Cotta Company, Limited, capitalized at $100,000. Messrs. J. M. McCarthy, Wm. Price and W. M. Dobell are given as the incorporators.

The building permits issued at Toronto during the period January 1st-April 30th this year represented a total value of $8,632,405. The corresponding figures for last year were $6,508,825. The 1913 and 1912 April returns were $3,740,826 and $2,842,995.

The Canadian Northern have submitted plans to the Montreal Council for the construction of yards in Hochelaga. The company have purchased some 220,000 square feet of land and ask the city to allow the closing of several thoroughfares.

The York County (Ont.) Highways Commission has spent some $300,000 on roadway improvements during the last two years. Work now under consideration contemplates the expenditure of a like sum. The construction to be undertaken this year involves $180,000.

The general revenue of Montreal for last year was $9,190,656, an increase of $1,533,823. The expenditure of the road department was $1,267,898; the water department, $663,769; the building inspector's department, $30,265; light department, $245,996, and incineration, $222,092.

Sir William Van Horne, in an interview last week, said that the engineers were still working on the plans for the immense development work which the company, of which he is head, will carry out at Grand Falls, on the St. John River. It involves the development of power and the erection of pulp and paper mills.

Work has been begun on the new marine depot which is being constructed by the Canadian Government near the head of St. John Harbour. It will be one of the most up-to-date marine depots along the coast. Government supplies for the coast service will be stored there and berths provided for the government steamers when in port.

Grand Trunk Pacific officials announce that steel has now reached the international line on the Regina-Boundary branch and will be linked up with the Great Northern Railway as soon as the necessary formalities have been completed. The first train on this new service between Canada and the United States will cross the border in the near future.

An outline of the new viaduct plans for Toronto is given in the bill introduced by Hon. Frank Cochrane respecting the Grand Trunk and Canadian Pacific Railways and the Toronto Harbor Commissioners. The plan for a four-track viaduct has been abandoned, and the Railway Commission will issue an order for a six-track viaduct, moved south to the water's edge.

At a meeting of the Westmount, P.Q., Council, a resolution was passed expressing appreciation of the services of Mr. Archibald Currie, the city engineer, who has resigned to become city engineer of Ottawa. Several members of the Council expressed their good wishes for Mr. Currie's success. There are many applicants for the position to be vacated by Mr. Currie.

The Council of Montreal have decided to construct boulevards on the banks of the aqueduct, tenders for the enlargements of which have just been received. A large part of the land for the boulevards has been given to the city.

[illegible] of opinion has been given in favor of a municipal system of filtration to be brought into operation on the completion of the widening of the aqueduct.

Owing to the severe illness of its chief engineer, the Suburban Railway Company at St. John has been somewhat delayed in carrying out its plans, but the St. John directors of the company give assurance that construction work will not be long delayed after estimates have been made up of the cost of constructing lines along the different routes out of the city, on which surveys have been made.

A meeting of the Council of The Royal Architectural Institute of Canada will be held in the rooms of the Ontario Association of Architects, 94 King street west, Toronto, on Tuesday, June 17, at 10 a.m., for the organization of the 1913 General Annual Assembly, and the transaction of any other business that may arise. Mr. J. H. G. Russell, Winnipeg, is President, and Mr. Alcide Chausse, Montreal, Secretary.

A new cement plant, having a capacity of 2,000 barrels a day, will shortly be placed in operation at Bamberton, B.C. The statement is made by Mr. H. K. G. Bamber, of London, Eng., who has had the supervision of the installation of plant and machinery. The plant represents an investment of about one million dollars. It has been under construction during the last eighteen months. Mr. Bamber has been invited to describe the plant in detail for the Vancouver Branch of the Canadian Society of Civil Engineers.

Members of the Regina Engineering Society recently paid a visit to the new disposal works at Regina. The trip was arranged by Mr. R. O. Wynne-Roberts, who was assisted by Commissioner L. A. Thornton, Superintendent J. M. McKay, City Engineer F. McArthur, together with Messrs. O. W. Smith and W. F. Ross, in showing the engineers around in small parties and explaining the details. It is hoped to make this plant, which is not yet completed, the subject of a detailed description in a later issue of the Contract Record.

Operations have been commenced on a million-bushel elevator, for the Grand Trunk Railway Company, at Windmill Point, Montreal Harbour. The structure has been designed, and is being constructed by the Canadian Stewart Company, Limited, Montreal. It will be located alongside the present Grand Trunk elevator, and will be built of concrete. Work is being rushed day and night, in order that the elevator may be ready for use in the fall, giving the company a total capacity of two million bushels. Loading and unloading of grain will be by means of electricity.

The supplementary estimates contain a vote of $500,000 for harbor improvements at St. John, $135,000 for building a spur line from the Intercolonial Railway to Courtenay Bay, where the new eastern harbor is being developed, and $50,000 to be expended on the extension of the breakwater at West St. John toward Partridge Island. This breakwater will eventually be extended the whole way, closing the passage and affording protection to the western harbor, and especially to the new steamship berths which will be extended from the present wharves down toward the island.

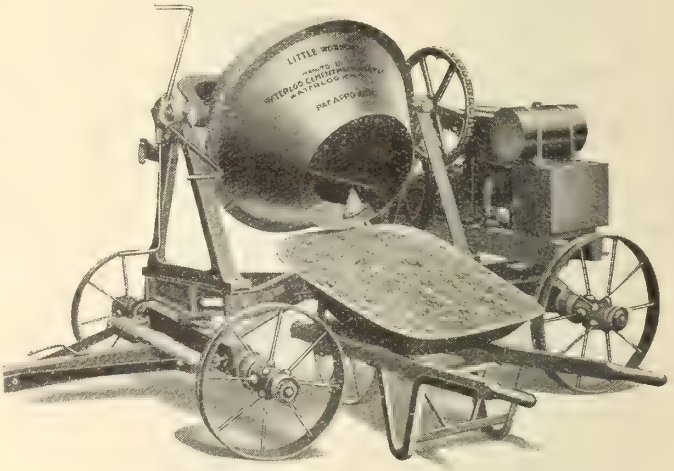
Twelve hundred men are now employed by the Montreal Tramways Company reconstructing the tracks, it having been decided to rebuild the entire system within two years. The 96-pound rails are being replaced by 116 lb. rails, and the ballast is heavier and deeper than that formerly used. The roadbed being laid consists of eight inches of crushed stone, two inches of stone dust as a bed for the ties, then six inches of concrete, and finally the blocks, which are grouted with cement. In certain sections special cedar ties are laid two feet apart, the length of the ties being increased.

A commission is shortly to be appointed by the Government to ascertain whether it will pay to construct the Georgian Bay Canal. Announcement to this effect was made at Ottawa last week by Hon. Robert Rogers in connection with an estimate of half a million dollars for "French River waterways improvements." The Minister intimated that he was carrying out the recommendation made some years ago by the Royal Commission on Transportation to the effect that it would be advisable to have investigation and report made upon the commercial feasibility of the Georgian Bay project. He said that the investigation would be made at once.

A new brick plant is now in course of construction at Varennes, P.Q., by the Mount Royal Brick Company, which was recently incorporated. It is expected that the plant will be completed in about five weeks. The clay lands, situate on the south shore of the St. Lawrence, total 272 acres, and the plant will have a maximum capacity of 100,000,000 bricks per annum. A feature is the employment of electrical machinery. The company is capitalised at $2,800,000. Ross and Macdonald, architects, of Montreal, in conjunction with United States experts, designed the plant, which is being constructed by the Canadian Stewart Company. Mr. James E. Fox former superintendent of the Laprairie Brick Company, has been appointed manager.

Profits on Small Concrete Jobs

Illustrated herewith is the Little Wonder "Five" concrete mixer, manufactured by the Waterloo Cement Machinery Corporation, Waterloo, Iowa. This is the original small tilting drum batch mixer. Its capacity is five cubic feet per batch, the 1913 model giving greater drum capacity than formerly without any increase of price. The drum is charged on one side and discharged direct into forms or barrows on the other. It is evenly balanced, easy to tilt, and will mix from 35 to 50 cubic yards a day, according to the efficiency of the crew and arrangement of the material and forms. There are no movable parts in the drum—nothing to clog or choke, and it has a very wide mouth, so that the mix is visible and its consistency easily controlled. The drum revolves on ball bearings which are carefully protected from dust, thus effecting a great saving of power.



Little Wonder "Five" concrete mixer.

The machine is simple in construction, strong and durable, and, being very light, easily portable. Its closely-coupled trucks allow turning in narrow places. It is readily installed in basements or on upper floors of buildings. It can be used to great advantage at points where the amount of concrete to be mixed does not justify the setting up of a large machine, and it is of great utility on large engineering projects when the heavier work is done and only the lighter work remains. The wide range of its adaptability is one of the secrets of its success.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

Pavements. City Engineer, Herbert Johnston. Tenders will be received by Clerk, A. H. Miller, up to June 12th for approximately 8,400 sq. yds. asphalt or bitulithic pavement, approximately 6,400 sq. yds. vitrified brick street car track allowance, and 6,800 lin. ft. curb and gutter. Plans and specifications can be seen at office of Engineer.

Brockville, Ont.

Paving, Perth street, planned by town council. Specifications, etc., at office of Town Engineer, G. H. Bryson, who will receive tenders until June 5th.

Burlington, Ont.

Sewerage system, planned by Village Council. Reeve, M. C. Smith. Clerk, James S. Allen. Engineer-in-charge, J. J. McKay, Bank of Hamilton Bldg., Hamilton.

Sidewalks, for Village Council. Reeve, M. C. Smith. Clerk, James S. Allen. Engineer-in-charge, J. J. McKay, Bank of Hamilton Bldg, Hamilton. 3½ miles of cement sidewalks and curbs.

Calgary, Alta.

Asphalt pavements, cost $25,000, 9th ave. west, planned by city council. Clerk, J. M. Miller. Engineer, Geo. Craig. By-law passed.

London, Ont.

Pavement, cost $11,780, Horton. Mayor, C. M. R. Graham. Chairman Board of Works, B. W. Bennett. Engineer-in-charge, W. N. Ashplant. Council has authorized the laying of an asphalt pavement on a 5 in. concrete base from Talbot to Wellington street. Tenders will be called at once.

Medicine Hat, Alta.

Water main extensions, cost $170,000, planned throughout new parts of the city. Clerk, H. Baker. Engineer, A. K. Grimmer.

Montreal, Que.

Paving, Maisonneuve, for city council. Council will call tenders for paving of Lasalle St. Sec.-Treas., Mr. Ecrement, City Hall.

Sewers, for Town of Longueuil. Mayor, St. Mars, 4 St. Lawrence Blvd., Montreal. By-law to be submitted for installation of sewers on St. Lawrence st., Montarville, [illegible] and [illegible] streets.

Moose Jaw, Sask.

Sidewalks and pavements, for city council. Clerk, E. B. Bonnell. City Commissioner, Jas. Pascoe, L. W. Rundlett, W. F. Heal. Contract (A), 204,000 sq. ft. sidewalk; 24,000 lin. ft. combined curb and gutter. Contract (B), 128,000 sq. ft. sidewalk; 21,400 lin. ft. combined curb and gutter, also for 17,000 sq. yds. of pavement. Specifications at office of Engineer. Tenders received by City Commisioners till June 6th, 1913.

North Bay, Ont.

Roadways, cost $75,000, contemplated by the Ontario Government. Road Commissioner, J. F. Whitson, Parliament Bldgs., Toronto. Trunk Road, North Bay to Mattawa, 46 miles.

Prince Albert, Sask.

Sewer pipe extensions, for city council. Clerk, C. O. Davidson. Contract (C), approximately 754 lin. ft. 15 in. sewer pipe with junctions; 6,324 lin. ft. 12 in. sewer pipe with junctions; 6,568 lin. ft. 10 in. sewer pipe with junctions; 39,662 lin. ft. 8 in. sewer pipe with junctions. Specifications at office of Engineer, M. H. Baker. Tenders received by Clerk till noon June 12th, 1913.

Water pipe extensions, for city council. Clerk, C. O. Davidson. Engineer, M. H. Baker. Contract (A), approximately, 2,520 lin. ft. 10 in. cast iron water pipe; 21,700 lin. ft. 8 in. cast iron water pipe; 26,300 lin ft. 6 in. cast iron water pipe; 43,000 lbs. special castings. Contract (B), 7 10 in. gate valves; 63 8 in. gate valves; 67 6 in. gate valves. Specifications at office of Engineer. Tenders received by Clerk till June 12th, 1913.

Regina, Sask.

Syphon for sewerage system, cost $15,000. Across Waskana Creek on Retallack street. About 1,040 feet of 12-in. and 9-in. steel pipe, 3/16-in. thick required. Plans in progress. Clerk, A. W. Pool. Engineer, F. McArthur.

St. Thomas, Ont.

City council contemplate sewer extension on West ave. and Redan st., and storm sewer on John st. Mayor, E. N. Price. Engineer, M. Ferguson.

Concrete macadam pavement, Wilson Ave., contemplated by the city council. Mayor, E. N. Price. Engineer, M. Ferguson.

Sarnia, Ont.

Tenders will be called for new granolithic walks on Mitton street and College Ave. and for a concrete roadway on Cromwell street. Mayor, Dr. Bell.

Simcoe, Ont.

Town Council contemplate laying new cement walks on Elmhurst, McCall, Norfolk, Maple and Owen streets. Mayor, L. C. Gibson. Clerk, W. C. McCall.

Strathroy, Ont.

Town Council contemplate [illegible] street. Mayor, Mr. Owens.

Town Council contemplate paving [illegible] street with [illegible]. Mayor, Mr. Owens.

Toronto, Ont.

Pavements and roadways, cost $[illegible],000, for Board of Control. Mayor, H. C. Hocken. Works Commissioner Harris recommends construction of a large number of new pavements, material-asphalt, brick, concrete, brick block, Rocmac Macadam.

Works Commissioner Harris recommends construction of cement concrete sidewalks on a number of streets, at a cost of $20,000. Mayor, H. C. Hocken.

Sewers, cost $12,000, for Board of Control. Mayor, H. C. Hocken. Works Commissioner Harris recommends construction of a number of new tile pipe sewers.

Board of Control contemplate street grading to cost $30,000. Mayor, H. C. Hocken. Works Commissioner Harris recommends grading of Christie, Morley and Springmount.

Bitulithic pavement, cost $15,000, on Oakmount road. Recommended by Works Commissioner Harris. Mayor H. C. Hocken.

Wallaceburg, Ont.

Town Council contemplate waterworks system. Ratepayers will vote on by-law June 2nd. Clerk, H. E. Johnson.

Wingham, Ont.

Paving, St. Josephine street. Tenders received by Clerk, Jno. F. Groves, up to June 10th for excavating and paving with concrete curb stones. Town will furnish road roller, stone crusher, screens and bins. Engineer, T. Harry Jones, City Engineer Brantford.

Storm Sewer, St. Josephine street, planned by town council. Engineer, T. Harry Jones, City Engineer, Brantford. Tenders received by Clerk, Jno. F. Groves, up to 4 p.m. June 10th.

Winnipeg, Man.

Paving planned by Board of Control. Engineer, H. N. Ruttan, 223 James avenue. Tenders received by Secretary, M. Peterson, until June 5, for 24 ft. asphalt No. 2 pavement on Wentworth St. from Grosvenor ave. to first lane north. Specifications, etc., at office of Engineer.

CONTRACTS AWARDED

Aylmer, Ont.

[illegible] planned by town council. Mayor, S. H. Wright. Clerk, D. C. Davis. General contractors, P. H. Secord & Sons, 137 Nelson street, Brantford, $1.49 per sq. [illegible]

Hull, Que.

Asphalt sidewalks, for City of Hull. Engineer-in-charge, J. A. Laforest, City Engineer, Hull. General contractors, International Construction & Supply Co., Hull.

Prince Albert, Sask.

Bridge for North Prince Albert Townsite Co., 1 Masonic Temple, will be erected across the Little Red River, North Prince Albert.

St. John, N.B.

[illegible]

[illegible] M. [illegible] City Hall. Engineer, [illegible] City Hall. General contractors, Granite Street Paving & [illegible] Co. [illegible] ft. straight granite curbing 67c per ft.; 200 ft. circular granite curbing, 90c per ft.

Stratford, Ont.

Main sewer, cost $12,270, for city council, Board of Works. Mayor, C. N. [illegible]. Clerk, R. K. Lane. Engineer, A. B. Manson. Chairman Board of Works, Ald. Henry Pauli. General contractors, [illegible] Yendt, Gadshill.

Railroads, Bridges and Wharves

Berlin, Ont.

[illegible] street railway, cost $30,000, King street, planned by City Council Railway Commission. Mayor, W. H. Schmalz. Ratepayers voted on by-law to raise the above amount to double track King street from Wellington to Waterloo boundary, distance of ½ mile.

Dundas, Ont.

Two bridges, Ogilvie, for town council. Chairman Board of Works, A. B. Wilson. Clerk, J. S. Fry. Engineer-in-charge, R. L. Latham, 146 Aberdeen Ave., Hamilton. Reinforced concrete, with steel.

Guelph, Ont.

C. P. Rly. Co. has been authorized to construct spur for the International Malleable Iron Co., Ltd., in Lot 1, Rge. 3.

Islington, Ont.

C. P. Rly. Co. has been authorized to construct bridge across Humber River, Islington, Ont., at mileage 7.4 London Sub-division, Ont.

Melita, Man.

R. E. Denny & Co., 32 Ninth street, Brandon, Man., have been franchised to build a street railway system and install waterworks.

New Westminster, B.C.

Bridge, cost $6,500, across Brunette River, planned by City of New Westminster and Coquitlam Municipality, to be of reinforced concrete construction with an 18-ft. roadway, with a four-ft. sidewalk.

Ogilvies, N.S.

Extension to breakwater for Dom. Govt. Dept of Public Works. Tenders will be received by Secretary, R. C. Desrochers, Ottawa, until June 18th, 4 p.m. Plans, etc., at office of C. E. W. Dodwell, Dist. Engr., Halifax; E. G. Milledge, Antigonish, N.S.; Postmaster, Ogilvies, and at Dept., Ottawa.

Province of Ontario

C. P. Rly Co. has been authorized to construct bridge No. 91.48 over Deadfall Creek, Cartier Sub-Div., Lake Superior Div., Ont.

Province of British Columbia

Canadian Pacific Railway Company has been authorized to construct bridge No. 119.2 on Boundary Sub. Div., B. C. Division.

County of Richmond, N.S.

Bridges, culverts, etc. Tenders will be received by Commissioner E. H. Armstrong, Halifax, Prov. Govt., Dept. of Works & Mines, until June 6th, for construction of the following—(1) Arichat Road from Arichat to Grandique Ferry, 6½ miles, 29 culverts. (2) Ferry Road from Grandique Ferry to Stewart's Corner, 2.7 miles, 12 culverts. (3) Road from Arichat to Grand River, Sec. from Stewart's Corner to St. Peter's Canal Bridge, 13 miles, 71 culverts. (4) Grand River Road from St. Peter's Canal to Grand River Cross Roads, 8½ miles, 26 culverts. (5) Grand River Road from Grand River Cross Roads to Grand River Bridge, 5.6 miles, 35 culverts. Plans and specifications at offices of N. W. McPherson, Road Inspector, St. Peter's. D. H. Campbell, Municipal Clerk, Arichat, Editor of "Journal-Bulletin," Port Hawkesbury, and at office of Commissioner, Halifax.

Shelburne Co., N.S.

Tenders will be received by Commissioner Hon. E. H. Armstrong, Halifax, N.S., Prov. Govt., Dept. of Works & Mines, until Friday, June 13th, for (1) 31 culverts on road between Lockeport Town and Jordon River Bridge—10 miles. (2) 64 culverts between Shelburne Town and Black Point, 16 miles. (3) 21 culverts between Greenwood Station and Port Clyde, 6 miles. (26) Culverts between Lockeport Town and Wells Corner, 5 miles. (64) Culverts between Shelburne Town and Little Port LeHebert, 10 miles. Specification and form of tender at office of Commissioner, Halifax. Bulk or separate tenders received.

St. Joachim, Ont.

C. P. Rly. Co. 's proposed location of station at St. Joachim on Lot 5, River Buscum, Range West, Twp. Rochester, Co. of Essex, Ont., has been approved.

Twp. Thorold, Ont.

G. T. Rly. Co. has been authorized to construct siding for Beaver Companies, on Lot 48, Twp. Thorold, Co. Welland, Ont.

Toronto, Ont.

Bloor street viaduct. Tenderers may prepare own plans and specifications and tender on same at same time as for reinforced concrete structure, those of steel design, safety of structure for 5 years must be guaranteed. Surveys, conditions of site, etc., will be furnished free by the Works Dept., H. C. Hocken, Mayor, Chairman Board of Control.

C. P. Rly. Co. has been authorized to construct 3 bridges: (1) No. 12.2 over Pallett's Creek, near Dixie; (2) No. 19.9 over Credit River, near Streetsville Jct.; (3) No. 28.4 near Hornby. All on London Sub-Div., Ont. Div., also (1) No. 14.9 on London Sub-Div., Ont. Div., near Cooksville, and (2) No. 36.6 on London Sub-Div., Ont. Dist., near Christie.

Waterdown, Ont.

Siding and switches about 900 ft. long from C. P. R. tracks to factories and lumber yards planned. Further information from W. J. Grant, 1 James St. N., Hamilton.

Weyburn, Sask.

Bridge, cost $25,000, 3rd street, contemplated by the Town Council. Sec.-treas., J. D. Murray. Engineer, Norman Murray. 35 ft. long, 30 ft. wide, structural steel and reinforced concrete construction. By-law will be submitted about June 15th. Plans have been prepared.

Winnipeg, Man.

Tenders received by Secretary, M. Peterson, till June 6th, 1913, for one second-hand single track three truss, steel railway bridge with span 80 ft., must carry 10-wheel locomotive of 34 tons and on rigid base of 14 ft. 10 in. followed by a load. Full description of bridge to be sent giving age, conditions, name of manufacturer, location, type, whether pin connected or rivetted, clearance width, height and weight. To be delivered f.o.b. Lac du Bonnet, including Canadian Customs if any.

CONTRACTS AWARDED

Burlington, Ont.

Concrete revetment wall, cost $21,000, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, W. G. Hutcheans and John Latimer, North Bay, Ont., and Arichat, N.S.

Calgary, Alta.

Railway to McLeod, for C. N. Rly. General contractors, The Northern Construction Company, 606 Union Bank Bldg., Winnipeg, Man. Work will start from MacLeod end of track.

Edmonton, Alta.

Bridge, cost $60,000, Saskatchewan, planned by city council and C. P. R. Clerk, C. Cox. City engineer, A. J. Latornell. General contractors, Carter, Halls-Aldinger Co., 1010 Union Bank Bldg., Winnipeg. Bridge over railway cut 66 ft. wide, 1 span 160 ft., concrete construction. Work started.

Ottawa, Ont.

Electric railway extension to Brockville, for Ottawa-Morrisburg Elec. Rly. Canada Life Bldg., Ottawa. President, J. G. Kilt, Citizen Bldg. General contractors, Reliance Contract Co., Chicago, Ill. Electric railway between Ottawa and Morrisburg.

Parish of Harvey, N.B.

Arch culvert and highway road diversion, cost $6,560, Albert Co., for Prov. Govt. Dept. of Public Works. Minister, Hon. John Morrissy, Fredericton, N.B. Prov. Sec., H. A. McLeod, Fredericton, N.B. General contractors, A. E. & G. F. Smye, Alma, N.B. "Anderson Hollow" concrete arch culvert and highway road diversion.

Windsor, Ont.

Water main valves, for city council, Water Commissioners. Sec., Wm. Hanrahan, City Hall. Contract for 50 brass water main valves awarded to Kerr Engine Works, Walkerville, at $6 to $16.75. each.

Public Buildings, Churches, Schools, etc.

Belleville, Ont.

Theatre, cost $75,000, Front street, for Griffin Amusement Co., 8 Queen St. E., Toronto, is under contemplation.

Bryon, Ont.

Preventorium, cost $15,000, for London Health Assn., Mrs. Adam Beck, Richmond St., London. Architect, W. G. Murray, Dom. Savings Bldg., London. Tenders received were too high and new tenders will be called at once.

Chatham, N.B.

Sunday school, cost $10,000, for Methodist Trustees. Pastor, R. G. Fulton. Architect, F. Neil Brodie, Princess St., St. John, N.B. Two storeys, 42 x 70, frame and cased brick construction.

Cochrane, Ont.

Church, contemplated for Holy Trinity

Parish. Rector, Rev. J. R. Bythell, The Rectory. Plans will be prepared.

Greenwood, B.C.

Post Office. Tenders received by secretary, R. C. Desrochers, Ottawa, Dominion Govt., Dept. of Public Works. Plans and specifications may be seen at office of resident architect and at Ottawa. Resident architect, Wm. Henderson, Victoria.

Georgetown, Ont.

School, cost $8,500, planned by town council. Clerk, H. W. Kennedy. By-law will be voted on.

Harrow, Ont.

I.O.O.F. hall is under consideration. Address Secretary, for further information. Two storeys.

Medicine Hat, Alta.

Court house, etc., cost $112,000, for Prov. Govt. Dept. of Public Works. Deputy Minister, John Stocks. Site has been purchased for court house and land titles, building for which $112,000 has been appropriated.

The School Board are contemplating a high school to be erected on Fifth ave. between Ottawa and Braemer Sts. Competitive plans will be called for shortly. Chairman, Walter Huckvale.

Milton, Ont.

Addition to school. Plans, etc., at Metropolitan Bank, Milton. Tenders received by Secretary, Wm. Main, until June 10th.

Milverton, Ont.

Post office, contemplated by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Govt. architect is preparing plans.

Montreal, Que.

Post office, for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until June 16th. Plans and specifications, at office of M. D. J. Spence, 40 Beaver Hall Hill, Montreal, and at Dept., Ottawa.

North Battleford, Sask.

Oddfellows Hall, cost $50,000, 2nd ave., is under contemplation. Two storeys, 100 x 50.

Red Deer, Alta.

Armoury planned by Dom. Government, Dept. of Militia & Defence. Sec-, E. F. Jarvis, Ottawa. Architect, C. A. Julian Sharman, Red Deer. To be erected on 2nd ave. S.E. 60 ft. x 100 ft. Tenders will be called shortly.

Saskatoon, Sask.

Club house, cost $4,000, Pike Lake, for The Saskatoon Automobile Club Limited. Architects, Thompson & Crockart, Masonic Temple, have been instructed to prepare plans.

St. Johns, Que.

Church, for R. C. Congregation. Priest, Rev. Father Labreche, Parish of Notre Dame [illegible] progress.

St. Thomas, Ont.

Grandstands, cost $6,000, for St. Thomas Baseball Club. Manager, George Ort. Fireproof construction. Plans in progress.

Sarnia, Ont.

Incinerator for town council. By-law for installing an incinerator and garbage plant, will be submitted to ratepayers. Mayor, Dr. Bell.

Simcoe, Ont.

Church, cost $18,000, for Baptist Congregation. Pastor, Rev. J. P. Bell. Architect, L. D. Barber, Brantford. Plans in progress.

Stratford, Ont.

Fair building, for North Perth Agricultural Society. Secretary, Jas. Stewart, Wellington street. Architect, Hepburn. One storey, 78 x 78. Plans prepared.

Picture theatre, 147 Ontario, for W. I. Kemp. 45 x 116. Plans in progress.

Twp. of North Grimsby, Ont.

School, for School Section No. 3. Trustees, W. E. Smith, W. F. Geddes and David Allan, of Winono. Plans prepared.

Toronto, Ont.

Theatre, cost $15,000, Gerrard E., for A. Wellwood, 1250 Bloor W. Architect, Neil G. Beggs, 12 Cosgrave Bldg. Three storeys, 40 x 120, structural steel construction, brick foundations. Plans drawn.

Market building, $20,000, St. Patrick's Market, for Board of Control. Mayor, H. C. Hocken. Plans approved by Property Committee, in clude 12 stalls and cold storage plant.

Fire hall, cost $24,000, Roncesvalles and Wright, planned by Board of Control. Mayor, H. C. Hocken. Two stys., brick construction.

Preventorium, planned for Imperial Order Daughters of The Empire, Dom. Bank Chambers. Tenders received by Architects, Stevens & Lee, 2 College St.

Wolfe Island, Ont.

Church, cost $75,000, for Sacred Heart Church Congregation. Priest, Rev. Father T. J. Spratt. Architects, Power & Son, Brock and Wellington street, Kingston, are preparing plans.

Winnipeg, Man.

Parliament Buildings, cost $2,000,000. Tenders received by Acting Minister Hon. G. R. Coldwell, Prov. Govt. Dept. of Public Works, until July 2, 1913. Architect, F. W. Simon, 260 Fort street. H-shaped building, 320 x 340 x 240 high. Plans, specifications at office of architect.

CONTRACTS AWARDED

Calgary, Alta.

Moving picture theatre, cost $120,000, for The Canadian Film Exchange, 8th ave. west. Work is done by day labor. An organ will be installed.

Duncan, B.C.

Hall and agricultural building, cost $13,000, for Cowichan Agricultural Society. Architect, S. B. Birds, Duncan Bldg., Vancouver. General contractors, Campbell Brown & Co. Building and hall to be of frame construction with a full agricultural equipment.

Elmira, Ont.

Library, cost $6,500, Arthur, for town council, Elmira. Architect, W. A. Mahoney, Guelph. General contractor, Emmanuel Martin, Elmira. Two storeys, artificial stone and pressed brick construction.

Extension to Evangelical Church, cost $5,000. Pastor, Rev. Mr. Meyer. Mason, C. Scheutz. Carpenter, F. Strome. Interior church fixtures, also Memorial Colored Glass windows and pipe organ to be installed. Send information re-glass and pipe organ to Rev. Meyer.

Hamilton, Ont.

Church, cost $17,500, Grosvenor ave., for Kensington Ave. Methodist Congregation. Architect, F. W. Warren, Federal Life Bldg. General contractor, John Bryers, 11 Clinton street.

Alterations to church, cost $13,000, James St. S., for James St. Baptist Church. Pastor, Rev. J. J. Ross, 85 Queen street south. Architect, H. H. New, Spectator Bldg. Carpenter, Stewart Bros., Hyde Park ave. Painting, Briggs & Hutchinson, 23 Walnut street north. Heating, Goodram Bros., 248 King west. Electric work, Allison & Co,. 441 King street east. 125 x75.

Addition to church, for St. Ann's R.C. Corporation. Architect, Robt. Clohecy, 226 John street south. General contractor, T. J. Drake, 49 Earl street.

Leamington, Ont.

Church, cost $7,000, for Methodist Congregation. Gen. Contractor, Henry Foster.

London, Ont.

School addition, Talbot street, for Board of Education. Architect, A. E. Nutter, Dom. Bank Bldg. Mason, Scott Murray, $3,369. Heating, Eggett & Co., 17 Masonic Temple, $5,728.

Sunday school, cost $22,000, for Centennial Methodist Church. Pastor, Rev. H. A. Graham. Architect, W. G. Murray, Dom. Savings Bldg. Mason, Jas. Moran, Dundas street. Carpenter, Walter Dann, 795 Lorne ave. Iron and steel, Dennis Wire and Iron Works Co., Ltd., 22 Dundas. Roofing, John Whittaker, 551 King street. Plumbing, Wm. Skelly, 242 King street. Electrical, The People's Electric Co., 641 Dundas.

Moose Jaw, Sask.

Church, cost $125,000, for R. C. Congregation. Rev. Father Woodcutter. General contractors, Navin Bros., Hammond Bldg. Cement foundation, brick construction, cut stone faced, fireproof floors.

Montreal, Que.

Academy, $500,000, Westmount, 1 Stanton St., for Protestant Board of School Commissioners, c/o Westmount Academy. Architect, D. H. MacFarlane, New Birks Bldg., Montreal. General contractor, C. E. Deakin, Sommer Bldg., Montreal. Three storeys and basement, 200 x 150, brick construction. Sub tenders to be called.

Catholic church, cost $158,000, Longue Pointe, Notre Dame east, for New St. Francis d'Assises Parish. Architect, Gauthier & Daoust, 180 St. James St., Montreal. Builders, L. J. Fauteux & Co., St. Benoit, Que. One storey, 200 [illegible]

Port Carling, Ont.

[illegible] England. Pastor, Rev. T. Bird Holland. Chairman of committee, F. D. Stubbs. General contractor, Bracebridge. 40 x 100, [illegible] construction.

Prince Rupert, B.C.

Church, South Young street, for First Baptist Church Congregation. Sec., J. H. Rogers. Architect, Harrison W. [illegible]

[illegible] Brick foundation and construction.

St. John, N.B.

[illegible] to hall, Coburg, for Knights of Columbus, St. John Council [illegible]. Architect, H. Claire Mott, [illegible] Germain street. General contractors, B. Mooney & Sons, 112 Queen street. Foundations in.

Scarboro, Ont.

School, cost [illegible], for Trustee Board. Architects, Munro & Mead, Chancery Chambers, Hamilton. General contractor, George Sainsbury, Western, Ont. General contractor will sub-let contracts for heating, plumbing and ventilating.

Toronto, Ont.

Cattle arcade, cost $63,000, Exhibition Park, for City of Toronto. Mayor, H. C. Hocken. Architect, G. W. Gouinlock, Temple Bldg. Mason, Jas. A. Wickett, Ltd., 28 Toronto street. One sty., 147 x 276, structural steel, brick and stone construction.

Walkerton, Ont.

Public library, cost $10,000, Durham, for Town Council Library Board. Chairman of Board, Jas. Warren. General contractors, R. E. Truax & Son. Sub-contracts not yet let. Red pressed brick construction.

Woodstock, N.B.

Library and agricultural school, Chapel, for Estate of L. P. Fisher. Trustee, Allison B. Connel, Woodstock. Architect, G. E. Fairweather, Germain st., St. John, N.B. General contractor, J. Fred Ryan, Fredericton, N.B.

Business Buildings and Industrial Plants

Brantford, Ont.

Foundry, cost $20,000, planned for Brantford Machine & Foundries, Ltd. Manager, H. B. Rowell, c/o Brantford Autocycles Ltd., tanks. Machine shop, 10,000 sq. ft., 1 storey. Foundry, 8,000 to 10,000 sq. ft., 1 storey.

Ft. William, Ont.

Wholesale grocery warehouse, Hardisty street, for A. MacDonald Co., 116 Market street East Winnipeg. P. Chapman. 130 x 75, solid brick construction. Building to be completed by fall. Plans ready.

Grassy Lake, Alta.

Elevator, cost $8,000, contemplated by The Alberta Farmers' Co-operative Elevator Company. Sec.-Treas., E. J. Fream. Plans in progress.

Hamilton, Ont.

Eight stores and apartments, cost $60,000, Catharine, for H. S. Brennen, 82 King William street. Plans in progress.

London, Ont.

Alterations to hotel, cost $50,000, Richmond, for Geo. H. O'Neil, proprietor, Tecumseh House. Architect, V. Munro, Bank of Toronto Chambers. Five stys., white brick construction, cement foundation. Plans in progress.

Factory, cost $20,000. Dennis Wire & Iron Works. Manager, E. R. Dennis. Company's architect is preparing plans. Three storeys, white brick construction.

Medicine Hat, Alta.

Bank building, planned by The Royal Bank of Canada, Head Office, Montreal. Site has been purchased on S.W. corner of Toronto St. and 14th Ave.

Montreal, Que.

Stores, cost $13,000, Maisonneuve, Ontario, for A. Guenette, 160 Pie IX. Architect, C. A. Reeve, 58 St. James st., Montreal. Owner will receive tenders for the trades. Three storeys, 45 x 80.

Store and flat, cost $7,000, De Fleurimont, for P. St. Denis, 2180 St. Hubert St. Designer, Mr. Samson, c/o Owner. Three storeys, 30 x 45, cement foundation, felt and gravel roofing. Owner is undecided whether to do work by day or call tenders.

Factory building, for General Fire Extinguisher Company, 175 McCord St. Architect, Robt. Findlay, 10 Phillips Place. Part of building, 127 x 300, concrete construction and foundation. Plans drawn.

St. John, N.B.

Factory, Marsh road, for Oil Motor & Mfg. Co., Ltd. Director, M. L. G. Vincent, 126 Charlotte street. Architect, F. Neil Brodie, Princess street, St. John is preparing plans. Brick or concrete construction.

Toronto, Ont.

Warehouse and office, King near Bathurst, for R. A. Lister & Co., 58 Stewart street. Architects, Designing & Draughting Co., 36 Toronto street. Tenders received by owner. Structural steel and brick construction, stone foundation.

Addition and alterations to office building, King and Bay, for Mail Printing Co., King and Bay streets. Architect, G. M. West, 78 Homewood Ave. Plans in progress.

Addition to factory, cost $6,000, Ontario Place, for L. G. Sainsbury, 279 Queen east. Architect, P. H. Finney, 79 Adelaide east. Two storeys, 30 x 60, brick construction, cement and brick foundation. Plans drawn.

Work shop, cost $3,000, Macklem, for W. H. Rogers, 138 Cooper Ave. Architects, Ellis & Connery, Manning Chambers. Two storeys, 20 x 40, brick construction and foundation. Plans drawn.

Vancouver, B.C.

Office building, Hastings and Hornby, for Credit Foncier Franco Canadian. Architects, H. L. Stevens & Co., Duncan Bldg., have prepared plans. Ten storeys, reinforced concrete construction.

Winnipeg, Man.

Bank building, planned for The Quebec Bank. Architects, Brown & Vallance, 32 Canada Life Bldg., Montreal. Four storeys, 40 x 40, concrete foundation, stone construction. Tenders will be called shortly.

CONTRACTS AWARDED

Calgary, Alta.

Warehouse, cost $4,000, Parkview, for S. G. Freeze, 8 ave. east. Builder, H. A. Sharpe, 2332 1st west. Two storeys, 24 x 40, cement foundation, brick construction. Excavating started.

Elmira, Ont.

Addition to furniture factory, cost $15,000, for Elmira Furniture Co., Ltd. Architect, C. Knechtel. Mason, C. Scheutz. Carpenter, Frank Strome, Elmira. Three storeys, 100 x 50, brick construction, cement foundation. Excavating started.

Halifax, N.S.

Store, cost $8,380, for W. F. Page & Co., Clothiers, corner Barrington and George streets. Builders and general contractors, Falconer & McDonald, 59 Granville street. Three storeys, 20 x 50, cement foundation, reinforced concrete construction.

Hamilton, Ont.

Addition to factory, cost $20,000, for Otis-Fenson Elevator Co., Victoria Ave. N. Architects, Stewart & Witton, 7 Hughson street south. General contractor, W. H. Cooper, 67 York street. Iron and steel, Hamilton Bridge works. One storey, 140 x 70, brick and structural steel, cement foundation, tile roofing, metal sash.

Store, apartments and mill, cost $12,000, Barton street east, for Dunlop-Magee Co., 125 John street south. Architect, F. Jas. Rastrick & Son, 30 King street east. Mason, R. Isbister, 125 Wellington street south. Three storeys, 28 x 70.

Bank, King street east, for Bank of Nova Scotia, head office, Toronto. Architects, Bond and Smith, 19 Wellington street west, Toronto. General contractors, Harris & Harris, Confed. Life Bldg., Toronto.

Addition and alterations to factory, cost $14,000, James street north, for Firth Bros., 106 James street north. General contractors, J. Poag & Company, Westinghouse Ave. Three stys.

Addition to factory, cost $90,000, for Dominion Steel Castings Co., Depew st. Architects, Prack & Perrine, James St. S. General contractors, H. G. Christman & Son, Main and Hughson streets. Iron and steel, Hamilton Bridge Works, Barton and Bay streets. 65 x 140. Foundations in.

Leamington, Ont.

Cannery, cost $25,000, for German Eckert Co., Rectory street. Manager, Wm. Gorman. General contractor, Wesley Link. Three storeys.

Montreal, Que.

Warehouse and office building, for Canadian Fairbanks-Morse Co., 444 St. James. Construction Engineer, T. Pringle & Sons, Ltd., 419 Coristine Bldg. General contractor, E. G. M. Cape, New Birks Building. Ornamental Iron, Dom. Architectural Iron. Co., 63 Dalhousie Roofing, Campbell, Gilday Co., Ltd., 663 St. Paul. Marble and Tile, The Hadrian Flooring Co., 128 Coristine Bldg. Plumbing and heating, L. E. Moulton & Co., 955 St. James. Electric work, W. N. Dietrich, Ltd., Read Bldg. Elevator, Otis-Fensom Elevator Co., 368 St. James St. Seven storeys and basement, all reinforced, 93 x 114, terra cotta, brick facings, 1 passenger and 2 freight elevators, telephone system.

Stores and flats, cost $21,000, Mance and Fairmont, for S. Arnovitz, 1925 Esplanade Ave. Architect, Arthur St. Louis, 80 St. Gabriel. Foundation and excavation, Godi Bros. Brick, S. Rochon, 1891 Esplanade ave. Carpenter, Farieau & Corbeau, 12 Erie street. Structural steel, Phoenix Bridge Co., 83 Colborne street. Plastering, Jos. Brousseau, 788 St. Andre. Other trades not yet awarded. Three storeys, 51 x 101.

Stores and residence, Burnside and University, for Walter Paul, 461 St. Catherine west. Architects, E. & W. S. Maxwell, 6 Beaver Hall Square. Brick and mason, Reid, McGregor & Reid, 14 Guy Block. Carpenter, D. M. Long, rear 39

Windsor. Roofing, D. Nicholson & Co., 679 St. Paul. Painting and glazing, Valentine & Guilbault, 38 Parc Lafontaine. Plumbing and heating, Hickey & Aubut, 93 Dominion. Electric, Wm. J. O'Leary & Co., 36 Reidlet. Plastering. G. H. Knapp, c/o Architect. Four stys., 30 x 70, brick.

Iron foundry, for The Robt. Mitchell Co., Belair ave. Builders and general contractors, Jas. Shearer Co., 225 St. Patrick. Roofing, heating and plumbing, Hickey & Aubut, 93 Dominion St. One storey, 108 x 180, brick construction. Foundations in.

Store and residence, cost $10,000, Chestnut and Jacques streets. Owner and general contractor, Maurice Tessier, Les Cedres, Que. Architect, R. Charbonneau, Les Cedres, Que. Three stys., 70 x 100, felt and gravel roofing. Foundations in.

Two stores and flats, cost $15,000, Montcalm and Dorchester. Builder and owner, Wilfrid Bastien, Montcalm and Dorchester. Three storeys, 37 x 61.

Stores and tenements, cost $12,000, 1807 Notre Dame, for Napoleon Marcotte, 1796 Notre Dame west. Architect, Rene Charbonneau, 15 St. James. General contractor, Mr. Lamoureux, 15 St. James. 2½-storeys, brick, stone foundation. Will rebuild at once buildings recently damaged by fire.

Montreal West, Que.

Stores and residence, cost $9,000, Westminster, for Montreal West Realty & Contracting Co., Westminster avenue. General contractor and architect, Owner. Two storeys, 25 x 45, brick encased construction.

Two stores, 3 flats and office, cost $32,000, St. James, for Montreal City and District Savings Bank, 176 St. James. Architect, A. H. Lapierre, 30 St. James street. Builder, Estate M. Huberdeau, 629 Demontigny east. Three storeys, 42 x 79, cement foundation, brick construction.

Moose Jaw, Sask.

Offices, cost $15,000. Architects and general contractors, Canadian City & Town Properties Co., Hammond Bldg. Four storeys, 50 x 100 cement foundation, brick construction. Excavating started.

Ottawa, Ont.

Printing shop and office, cost $8,000, George, for Miss F. W. Evans, c/o N. D. Porter, 109 Bank street. General contractor, R. Bennett. Solid brick construction, cement fuondation.

Workshop and office, cost $4,500, for R. A. Sibbitt, Queen and Albert. Architect, J. Albert Ewart, 193 Sparks street. General contractors, Cuthbertson & Clarke, 706 Echo Drive. 33 x 44, solid brick construction, cement foundation.

Alterations to store, Slater, for John A. Bourse, Slater street. Architect, W. Herbert George, Castle Bldg, Queen st. General contractors, Esdale & Douglas, 318 Lisgar. Solid brick construction, electric lighting, birch floors. Store fronts and fixtures.

Office and warehouse, cost [illegible], Frank, for J. T. Blythe, 394 Bank street. Feneral contractors, Alexander & Campbell, 587 Lisgar. Solid brick construction

Prince Albert, Sask.

Jewellery store, cost $5,000, for F. W. Wright, River street. Architects, Creighton & Crowther, K.C. Bldg. General contractors, Bonas Bros., West 12th street. Three storeys, cement foundation, brick construction. Excavating started.

Quebec, Que.

Hotel, cost $150,000, for Hotel St. Roch, St. Joseph street. Architect, Talbot & Dioine, 16 St. Joseph street. General contractors, Jinchereau & Lamonde. Iron and steel, S. H. Gaudry Co., 76 St. Pierre. Roofing, N. Barbeau, 36 Bridge street. Painting, Gauthier & Frere Co., 292 St. Joseph. Five storeys, 110 x 115, brick and stone construction.

St. Thomas, Ont.

Brass factory, cost $25,000, Wellington, for St. Thomas Brass Co., M. C. R. Yards. Manager, J. B. Potts. General contractor, Albert E. Ponsford, 605 Talbot street. One storey, 120 x 60; 20 x 60, structural steel, concrete and white brick construction.

Toronto, Ont.

Restaurant, cost $90,000, 7 King east, for H. L. Bowles, Springfield, Mass. Architects, Hand, Harris & Merritt, 16 King west. General contractor, mason and carpenter, W. T. Joy, 125 Quebec Ave. Iron and steel, Hamilton Bridge Co., Hamilton. Reinforced concrete, A. Gardner & Son, Yonge street Arcade. Terra cotta, Northwestern Terra Cotta Co., 2525 Claybourn Ave., Chicago, Ill. Tile and marble, Lautz Dunham Co., 145 Church street. Four storeys and basement, 30 x 100.

Addition to factory, cost $5,000, for Cotton Mfg. Co., 864 Dufferin street. Builders, R. G. Harmon & Son, 158 Dupont street. One storey, brick construction and foundation, felt and gravel roofing.

Garage, cost $3,500, 881 Yonge street. Owner and builder, J. D'Onofrio, 63 Elm street. Two storeys, 34 x 60, brick construction and foundation.

Winnipeg, Man.

Stores, Logan ave., for Thos. Ryan, c/o Thos. Ryan & Co., Princess street. Architect, Mr. Blatherwick, c/o owner. General contractor, G. Hartford, 158 Aikens street. One storey, brick foundation and construction.

Warehouse, cost $21,900, Isabel street, for Crane & Ordway, 93 Lombard St. Architect, J. H. G. Russel, 1010 McArthur Bldg. General contractors, S. Brynjolfson & Sons, corner Carfield and Sherburn. One storey, 60 x 150.

Warehouse, cost $26,000, Jarvis Ave. Architects and general contractors, Dingle & Stewart, 263 Stanley street. One storey, 66 x 90, brick foundation and construction. Excavating started.

Warehouse, cost $10,000, Pacific Ave., for Crane & Ordway, 93 Lombard street. Architect, J. H. G. Russell, 1111 McArthur Bldg. General contractors, S. Brynjolfson Co., 506 Builders' Exchange.

Residences

Chatham, Ont.

Printing plant, cost [illegible] planned by Henry Stephenson, c/o The Planet, Chatham.

Druid, Sask.

Hotel, cost $25,000, contemplated by N. Beauchmin. Three storeys, will have 25 rooms.

Dundas, Ont.

Five residences, cost $12,000, for Jones Bros., Furniture Mfrs., head office Toronto. Local manager, Geo. Halberstadt. Residences for employees. Two storeys, 28 x 20, roughcast construction. Plans prepared.

Haileybury, Ont.

Pulp and paper mill planned by Riordon Pulp and Paper Co., Ltd., 1 Beaver Hall Sq., Montreal. Contemplating plant at New Liskeard also.

Hamilton, Ont.

Residence, cost $9,000, Mountain Top, for A. V. Young, 301 James street S. Tenders received by architect, Stewart McPhie, Bank of Hamilton Bldg.

Alterations and addition to residence, Ravenscliffe for Sir John M. Gibson, Government House, Toronto. Architects, Munro & Mead, Chancery Chambers. Three storeys and tower.

London, Ont.

Apartment, cost $35,000, Princess ave., for Seath & Smith, 510 Wellington St. Five storeys, 55 x 82, stone trimmings, red pressed brick construction, stone and cement foundation. Plans in progress.

Montreal, Que.

Flats, cost $5,000, for R. B. Eaton, 3186 Park Ave. Three storeys, 50 x 60, concrete foundation. Plans drawn.

Flats, cost $12,000, Belgrave. Builder and owner, A. Desjardins, 140 Villoneuve East. Owner will call for tenders this week. Two storeys, 52 x 60.

11 flats, cost $12,000, Maisonneuve, 1st Ave. General contractor and owner, W. Tardiff, 89 Adam street. General contractor will call tenders for trades about June 7th. Three storeys, 74 x 50.

Moose Jaw, Sask.

Residence, cost $6,000, for Dr. Ellwood Cox. Architect, T. Carmichael, Walter Scott Bldg. Two storeys, 35 x 20, cement foundation, frame construction. Plans in progress.

Medicine Hat, Alta.

Car wheels plant planned by a syndicate. Interested, Felix Frank, Managing Director, Great West Iron, Wood & Chemical Co., Prince Albert, Sask. David B. Hanna, 3rd Vice-president, C. N. R. F. H. Phippen, Chief Counsel, C. N.R. M. C. Grant, German Counsel, Halifax, N.S., and Director Pender Nail Works, St. John, N.B. Hector McInnis, Director Bank of Nova Scotia and Dominion Corporation. Company have entered into agreement with city to erect large plant to manufacture car wheels.

Ottawa, Ont.

Apartments, cost $12,000, Elgin, for S. Coplan, 282 Murray. Architect, A. L. Weeks, 75 Sparks. Four storeys, 61 x 76, solid brick construction. Plans ready.

Apartments, cost $15,000, for A. Pommerville, 550 Lisgar street. Brick veneer construction, cement foundation. Plans in progress.

Residence, cost $8,000, Monkland, for Richard Hooper, 91 4th avenue. 2½-stys., 30 x 36, brick veneer construction. Plans ready.

(Continued on page [illegible])

Tenders and For Sale Department

[illegible] to the undersigned [illegible] "Tender for Electric Elevator, etc., [illegible] Ste. Marie, Ont.," [illegible] received at this office until 4 p.m., on Wednesday, June 11, 1913, for the installation [illegible] to include [illegible] for generator set, penthouse, enclosure, founda- [illegible]

Tenders will not be considered unless made [illegible] forms furnished by Department, and in [illegible] with conditions contained therein.

[illegible] and specifications to be seen on application to Mr. P. J. Racine, Caretaker, Public [illegible] ing, Sault Ste. Marie, and at the Depart- [illegible] Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
—42111. Ottawa, May 22, 1913. 22-23

Tenders for Sewerage Works

City of Sault Ste Marie, Ontario

Sealed tenders, fully endorsed and marked "Tender for Sewerage Works," addressed to T. E. Simpson, Mayor, Sault Ste. Marie, Ont., will be received by the City Clerk up to seven o'clock p.m. on **Monday, June 9th, 1913**, for supplying and laying about 18,000 lineal feet of tile sewer pipe with appurtenances.

Specifications and plans may be seen, and all information and forms of tender obtained at the office of the City Engineer, Sault Ste. Marie, Ont.

A marked cheque for 5 per cent. of the amount of the tender, payable to the order of the City Treasurer, must accompany each tender.

The lowest or any tender not necessarily ac- [illegible]

C. J. PIM, City Clerk.
W. W. VAN EVERY, City Engineer.
22-23

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at [illegible]

Contract Record and Engineering Review

[illegible]
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Sealed Tenders

Sealed tenders will be received up to **Monday, 8 p.m., June 19th, 1913**, for the construction of Twenty-five thousand feet, more or less, Cement Concrete Sidewalks in the Village of New Hamburg. Particulars can be had by applying to the town clerk.

J. F. KATBENMEIR,
21-24 Clerk.

Tenders for Laying Water-pipe

Tenders will be received by the undersigned up to four o'clock p.m. on **Tuesday, June 10th, 1913**, for the laying of 920 feet of 8-in. water pipe. Corporation to furnish all material; contractor to furnish all labor and tools. Plans and specifications can be seen at the office of the undersigned. The lowest or any tender not necessarily accepted.

JOHN F. GROVES,
22-23 Clerk, Town of Wingham.

Tenders for Pavements

CITY OF BERLIN

Sealed tenders, addressed to A. H. Millar, City Clerk, will be received up to 5 o'clock p.m., **June 12, 1913**, for approximately 8,400 square yards of Asphalt or Bitulithic Pavement; approximately 6,400 square yards of vitrified brick street car track allowance and 6,800 lineal feet of curb and gutter.

Plans and specifications may be seen at the office of the City Engineer after May 30.

The lowest or any tender not necessarily accepted.

HERBERT JOHNSTON,
22-24 City Engineer.

TENDERS

Tenders will be received until **Thursday, June 12th**, at 12 o'clock noon, for the supply and delivery of the following materials for sewer and water extensions in the City of Prince Albert.

(A) Approximately—
2,520 lin. ft. 10-in. cast iron water pipe.
21,700 lin. ft. 8-in. cast iron water pipe.
26,300 lin. ft. 6-in. cast iron water pipe.
43,000 lbs. special castings.

(B) 7—10-in. gate valves.
63—8-in. gate valves.
67—6-in. gate valves.

(C) Approximately—
754 lin. ft. 15-in. sewer pipe with junctions.
6,324 lin. ft. 12-in. sewer pipe with junctions.
6,568 lin. ft. 10-in. sewer pipe with junctions.
39,662 lin. ft. 8-in. sewer pipe with junctions.

Tenders shall be addressed to C. O. Davidson, Esq., City Clerk, Prince Albert, Sask.

Specifications and full information may be obtained from the City Engineer.

The city reserves the right to reject any or all tenders.

N. W. MORTON,
C. O. DAVIDSON,
F. A. CREIGHTON, City Commissioners.
M. H. BAKER, City Engineer.

Dated at Prince Albert, Sask. 22-23

Tenders for Reservoir

Tenders will be received by the undersigned up to four o'clock p.m. on **Tuesday, June 10th, 1913**, for the construction of a concrete reservoir, 40 ft. x 40 ft. and 12 ft. deep. Plans and specifications can be seen at the office of the undersigned. The lowest or any tender not necessarily accepted.

JOHN F. GROVES,
22-23 Clerk, Town of Wingham.

Tenders for Paving

Tenders, separate and en bloc, will be received up to 4 o'clock p.m. on **Tuesday, June 10th**, for the following works:

1. The construction of a storm sewer on Josephine street in the Town of Wingham, according to the plans and specifications prepared by T. Harry Jones, C.E., of the city of Brantford.

2. The work of excavating, paving with concrete and curb-stones on Josephine street in the Town of Wingham, according to the plans and specifications prepared by T. Harry Jones, C.E., of the city of Brantford.

The town will furnish road roller, stone crusher, screens and bins.

All tenders to be addressed to the undersigned by registered post. Plans and specifications can be seen at the office of the undersigned in the Town Hall, Town of Wingham.

The lowest or any tender not necessarily accepted.

JOHN F. GROVES,
22-23 Clerk, Town of Wingham.

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Trenton, Ont.," will be received until 4 p.m., on **Tuesday, June 10, 1913**, for dredging required at Trenton, Ont.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specifications and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa May 21, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42227. 22-23

TOWN OF PRESTON

Tenders for Pavement on Guelph St.

Sealed tenders, plainly marked as to contents, will be received by the undersigned up to noon of **Monday, June 9th, 1913**, for the construction of approximately 3,300 sq. yds. of Bitulithic Pavement and approximately 2,200 lin. ft. of concrete curb and gutter.

Plans and specifications and all necessary information may be seen at the office of the undersigned, 57 Adelaide street east, Toronto..

A marked cheque for two and one-half per cent. of the amount of the tender must accompany each tender.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Consulting Engineer.
Toronto, Ont., May 31, 1913. 23

TENDERS

Tenders will be received by the undersigned till noon on **Friday, June 20th**, in bulk or separately, for the following departments in connection with the Hudson's Bay Company's Departmental Store, Vancouver, B.C.

- Steam-Fitting
- Electric Wiring.
- Plumbing.
- Refrigeration.
- Vacuum Cleaning.
- Sprinklers.
- Steam Driven Generating Units.
- Turbine Generating Units.
- Steel Smoke Stack.
- Suction Ash Conveyor.
- Pneumatic Cash Tubes.

BURKE, HORWOOD & WHITE,
Architects,
28 Toronto Street,
23 Toronto, Ont.

Tenders for Construction of Bloor Street Viaduct in Reinforced Concrete

Those desiring to submit tenders on reinforced concrete construction for Bloor Street Viaduct, are hereby notified that they may prepare and submit, without any expense, whatsoever to the City, their own plans and specifications, and may tender on same.

These tenders will be received at the same time as those for the steel design.

Tenderers for a reinforced concrete structure will be required to guarantee the safety of same for a period of five years from date of completion, and shall state in their tenders, the form [illegible]

Surveys, boring records, conditions at the site and other necessary information in the possession of the Works Department will be furnished, without fee, upon request.

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relating to tendering, as prescribed by City By-law No. 4294, must be strictly complied with.

Tenderers shall submit with their tenders, the names of two personal sureties approved by the City Treasurer, or in lieu thereof, the bond of a guarantee company satisfactory to the City Treasurer.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
City Hall, Toronto,
May 20th, 1913 23-24

CONTRACTORS

Why don't you try this new firm for quick delivery of supplies. The International Supply & Construction Co., Ltd., Hull, Que. 21-24

Sealed tenders addressed to the undersigned and endorsed "Tender for Postal Station "G," Toronto, Ont.," will be received at this office until 4 p.m. on **Wednesday, June 25, 1913**, for the construction of the building mentioned.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. E. J. Lennox, Architect, 164 Bay street, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 2, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40090. 23-24

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Trenton, Ont.," will be received until 4 p.m. on **Thursday, June 12, 1913**, for dredging required at Trenton, Ont.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specifications and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for fifteen hundred dollars ($1,500), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, 28th May, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—[illegible] 23

Tenders for Bridge Construction

Sealed tenders, plainly marked as to contents, will be received by the undersigned up to noon of **Wednesday, June 11th, 1913**, for the construction of three bridges, W 12, W 13 and W 14, over the Cold Creek on the Townline between the Counties of York and Peel near Bolton, opposite Lots 7 and 8 Township of King.

Plans, specifications and all necessary information may be seen at the office of the undersigned, 57 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
County Engineer.
Toronto, Ont., May 31st, 1913. 23

Tenders for Highway Bridges

Sealed tenders, marked "Tender for Steel Bridges," will be received by the undersigned up to 9 p.m. on **Saturday, June 14th, 1913**, for the construction and erection of two low truss, box chord steel highway bridges in the County of Peel. The spans being respectively 40 feet and 45 feet.

A form of tender and all information may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHEELOCK,
County Engineer,
Orangeville, Ont.
Orangeville, May 28, 1913. 23-24

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Collingwood, Ont.," will be received at this office until 4 p.m. on **Monday, June 23, 1913**, for the construction of a Public Building at Collingwood, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. Philip C. Palin, architect, Collingwood, Ont., at the office of Mr. Thos. A. Hastings, Clerk of Works, postal station "F," cor. Yonge and Charles streets, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, [illegible] 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 39678. 23-24

Tenders for Debentures

[illegible] Monday June 12, 1913, [illegible] Hydro [illegible] the Village of [illegible] per cent. pay[illegible] principle and in[illegible]

[illegible] necessarily accepted.

J. H. Ruppel, Clerk.

[illegible] 22-23

Tenders Wanted

[illegible] June 14th, 1913 [illegible]

[illegible]

[illegible]

Double 50 ft. Concrete Arch.

Concrete Road in St. Jacobs.

All of the above are in the Township of Woolwich, County of Waterloo. For further information apply to

BOWMAN & CONNOR, Civil Engineers,
36 Toronto Street,
Toronto, Ont.

THE PAS, MANITOBA

[illegible] endorsed on the envelope, Tender for (tender bidding on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the Town of The Pas, will be received up to 6 p.m., **July 1st, 1913**, for the supply of the following materials, and the performance of certain works:

Tender A

3770 ft. of 24-in. Vitrified Sewer Pipe.
5470 ft. of 20-in. Vitrified Sewer Pipe.
2000 ft. of 18-in. Vitrified Sewer Pipe.
600 ft. of 15-in. Vitrified Sewer Pipe.
1200 ft. of 6-in. Vitrified Sewer Pipe.

Excavating and laying and construction of Manholes, Catch Basins, Flush Tanks, etc.

Tender B

Trenching and laying of approximately—

4400 ft. of 12- in. steel pipe.
3500 ft. of 10-in. steel pipe.
4400 ft. of 8-in. steel pipe.
2000 ft. of 6-in. steel pipe.

Setting Valves, Hydrants, etc., and back filling.

Tender C

For the erection of Power House.

Tender D

For the erection of Pole Line.

Tender E

For the supply, delivery and erection of Motors, Pumps, Piping, and Air Compressor.

Tender F

For the supply and delivery of Poles, Wires, Line material, etc.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved surety company. The lowest or any tender not necessarily accepted.

The tender forms must be filled in—copies of which are attached to the specifications, or are obtainable at the office of the Consulting Engineers.

Plans and specifications may be seen at the office of the Consulting Engineers, The Canadian Engineer, 820 Union Bank Bldg., Winnipeg, and at the resident engineer's office, The Pas, Man., or a complete set of plans and specifications for any contract will be given or forwarded on a deposit of Twenty-five ($25) Dollars, and a set covering all contracts on a deposit of One Hundred ($100) Dollars. The deposit cheque will be returned if plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D.,
Secretary-Treasurer,
The Pas, Man.

MURPHY & UNDERWOOD,
Consulting Engineers,
23-26 Ross Block, Saskatoon, Sask.

TENDERS

Will be received by the undersigned till **June 18** for the erection of a Methodist Church at Simcoe and Scott streets, Peterborough. Drawings and specifications may be seen at my office or at the offices of Burke, Horwood & White, architects, 28 Toronto street, Toronto.

W. G. Morrow, Chairman of Building Committee, 437 George street, Peterborough. 23

Notice to Contractors

SEWERS

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, June 10th, 1913**, for the construction of the following sewers.

King street—Bathurst street to Portland street.
Marchmont Road—Ossington Ave. to Shaw St.
Park Place—Keele St. to Indian Grove.
Indian Grove—From 220 ft. south to Ridout Street to 200 ft. north of Howard Park Avenue.
Lane 1st west of Beverley street, St. Patrick street to Grange avenue.
Lane 1st west of Crawford street, Harrison street, 700 ft. north.

Envelopes containing tenders must be plainly marked on the outside as to contents. Specifications may be seen and forms of tenders obtained at the office of the Commissioner of Works, Toronto. Tenderers shall submit with their tender the names of two sureties, or in lieu of said sureties, the bond of a Guarantee Company approved of by the City Treasurer. The usual conditions relating to tendering, as prescribed by the City By-law, must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman Board of Control.
Toronto, May 28th, 1913. 23

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Port Arthur, Ontario," will be received until 4 p.m., on **Friday, June 13, 1913**, for the dredging required at Port Arthur, Ont.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, May 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42848. 23-24

TOWN OF BROCKVILLE

TENDERS

Sealed tenders, endorsed "Tender for Paving Perth Street," will be received by the undersigned up to 4 o'clock p.m., **June 5th, 1913**, for the paving and laying storm drains, etc., on Perth street.

Further instructions as to specifications and form of tender can be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

G. H. BRYSON,
Town Engineer.
Brockville, May 26, 1913
22-23

For Sale

1—8 Tons Scotch Derrick—40 ft. Boom, Horse drive, good as new. Apply The Canadian Boving Co., Limited, 164 Bay Street, Toronto. 23

For Sale

New, Modern Toronto Factory. Would make ideal wood-working plant or machine shop. Lots of land for extensions. Very central location. Immediate possession. Price $40,000 cash. Box 809, Contract Record, Toronto, Ont. 23

For Sale

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

For Sale

- 1 Scow, 15 x 30 ft., nearly new.
- 1 Anchor, 400 lbs.
- 1 Anchor, 300 lbs.
- 3 Anchors, 200 lbs. each.
- 2 Sling Chains, 25 ft. long.
- 1 set Deferential Blocks complete.
- 1 pair of Shear legs.
- 1—12-in. Lead Pot (for melting).
- 1 Diaphram Pump (for drains).
- 1—5-in. Centrifugal Pump.
- 1 Tool Truck.
- 25 Drain Stays, 2 ft. 6 in.

Apply to McQuillan & Company,
1457 Queen Street West,
23-25 Toronto, Ont.

BARGAINS!

All Steel Drag Line, Lidgerwood, Class B. with 1½ yd. and 1 yd. buckets, 60 ft. boom; A.1.	$3,200
No. 0 Thew Steam Shovel, used less than 90 days, shop No. 690, practically new.	3,300
30 1½ yd. end dump cars, 36 in. gauge, practically new, each	30
1 American Well Works Air Compressor, 12 x 12 x 14, 340 ft. capacity, new ...	440
1 Rand Belted Compressor, 10 x 14, A.1.	240
1 Austin No. 0 Trenching Machine, used 1½ years thoroughly overhauled	2,700

THAT'S NOT ALL

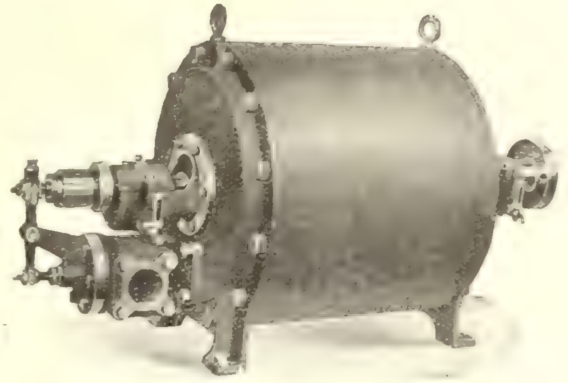
For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

(Continued on page 76)

The "Economy" Steam Turbine



Steam turbines of small power long since demonstrated their superiority over reciprocating engines in every respect but economical steam rate. This one and only criticism is now entirely overcome in our new Economy Turbine which shows 10 to 15 per cent. steam economy improvement over our older or Kerr design in non-condensing, and often 25 per cent in condensing service.

This has been accomplished with improved blade and vane construction producing flow parallel with the turbine shaft.

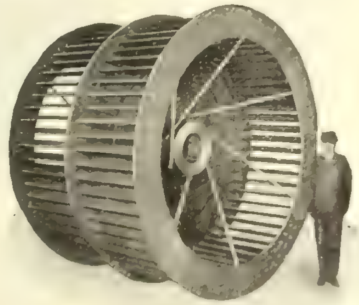
Our bulletin on the "Economy" Steam Turbine is not a mere catalogue but the best engineering discussion of the small steam turbine ever printed. It will interest you.

Canadian agents for the Kerr Turbine Co.

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.

Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.



BLOWERS **FANS**

Made In Canada

Low cost of Installation, low cost of Operation, low cost of Maintenance, and High Efficiency are the deciding features of "Sirocco."

Engineering Service

Aside from our own Expert Engineers we have at our command the co-operation of the Engineering Service Department of the American Blower Company, and the results of years' of experience of S. C. Davidson, the inventor, Belfast, Ireland.

A "Sirocco" Fan will deliver more air with less power than the ordinary steel plate fan **twice** the size.

"Sirocco" Fans and Blowers are used in connection with apparatus for Heating, Ventilating and Cooling, in Industrial, Educational, Office and Public Buildings.

For Forced and Induced Draft under steam boilers on land and at sea.

The world's largest boats use "Sirocco" Fans for Forced Draft and Hull Ventilation.

The British Navy use "Sirocco" exclusively.

Let us tender on your next air handling problem. The services of our Engineering Department are at your command.

You
Should Read
"Sirocco"
Bulletin
No. 3401

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Write for it
today.

CANADIAN *Sirocco* COMPANY

LIMITED

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Sales Engineers:

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E. C. Powers, Room 5, 43 Victoria St., Toronto
W. P. Eddy, 214 Donald Street, Winnipeg
S. S. Clarke, 605 Second St. West, Calgary

For Sale

One No. 1 [illegible] Rail Track Concrete Mixer [illegible] Steam Engine and Boiler, [illegible] and [illegible] Measuring [illegible] Capacity, [illegible] of mixed concrete.

[illegible] and has never been used. Will be sold at a bargain as the [illegible]

[illegible] Box [illegible] Contract Record, Toronto, Ont. 23-26

DO YOU NEED HELP?

[illegible] We [illegible] any amount of [illegible] and unskilled labor at shortest notice

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
[illegible] 23-25

Situations Wanted

[illegible] May 31st. [illegible] Paper Mills. Supervision and [illegible] and estimates. [illegible] Contract Record, Toronto, Ont. 23-24

Situations Vacant

Wanted

[illegible] Engineer for the City of Westmount. State qualifications, experience and salary required. Applications will be received up to June 10th at noon, addressed to the Mayor, Westmount, P.Q. 23

Residences

(Continued from page 71)

Toronto, Ont.

Store and residence, cost $28,000, Ascot and Nairn, for R. P. Cranfield; 155 Robert street. Architect, R. G. Bainbridge, 165 Shanley. Two storeys, brick construction and foundation. Plans drawn.

Residence, cost $5,000, Burlington ave. for A. Stewart, 22 Rushton Road. Architect, W. G. Hunt, 990 Bloor St. W. 2½ storeys, 25 x 35, brick construction, stone foundation. Plans drawn.

Apartments, cost $12,000, for E. E. Horton, 13 Ross Ave. Architects, Gordon & Helliwell, Confed. Life Bldg. Three storeys, 24 x 60, brick construction and foundation. Plans drawn.

Residence, cost $4,000, 280 Merton, for Wm. Snell, 278 Merton street. Architects, Gordon & Helliwell, Confed. Life Bldg. Two storeys, 22 x 30, brick construction, stone foundation. Plans drawn.

Residence, cost $7,500, Woodlawn Ave., for V. F. Cronyn, 67 Victoria St. Architect, A. George, 67 Victoria St. 2½ storeys, 32 x 45, brick construction, stone foundation. Plans drawn.

Residence, cost $4,600, Summerhill Gardens, for David Modely, 40 Ossington Ave. Two storeys, 32 x 42, brick construction, stone foundation. Plans drawn.

West London, Ont.

15 residences, cost $40,000, Wharncliffe, Architect and owner, George Churchill, 194 Wharncliffe Road. 1½ & 2 storeys, white brick construction. Plans ready.

30 residences, cost $36,000, Grosvenor, for Geo. Fielding, c/o P. Walsh, 425 Richmond street. Architect, W. G. Murray, Dom. Savings Bldg. One sty., white brick construction.

CONTRACTS AWARDED

Belleville, Ont.

Residence, cost $7,000, William, for W. B. Deacon. Builder and general contractor, Jas. Moon. Two storeys, 36 x 40.

Edmonton, Alta.

Residence, cost $23,500, Victoria ave., for H. V. Shaw, 745 Fifth street. Architects, Magoon & MacDonald, 504 Teglar Block. General contractor, L. F. Kelsey, 214 Jasper ave. east. 2½ stys., 31 x 46, concrete foundation, brick construction. Excavating started.

Residence, cost $10,000, Athabasca st. Builder and owner, Jas. Matthews, Gen. Delivery. Two storeys, 27 x 43, brick construction.

Essex, Ont.

Residence, cost $5,000, Alice, for Dr. A. G. Snell, Essex. Architects, G. Jacques & Co., Boug Bldg., Windsor. Two storeys, 25 x 37. Work being done by day labor.

Power Plants, Electricity and Telephones

Hull, Que.

Power plants, cost $1,250,000, for Hull Power Co. Reinforced concrete power house and new concrete water channel. Work being done by day labor.

Medicine Hat

Telephone exchange building, contemplated by Prov. Govt. Dept. of Railways and Telephones. Deputy Minister, W. J. Harmer, Edmonton. Site purchased on Ottawa street, between 5th and 6th streets for erection of 3-storey building, with provision for 10,000 subscribers. Arrangements are also being made to install automatic phones instead of the bell phone.

Montreal, Que.

Extension to power house, Davidson, for Canadian Pacific Railway Company. Architect, C. P. R. Engr. Dept., Windsor street station. General contractor, D. G. Loomis, St. Patrick Avenue. One storey, 50 x 65, brick.

River Glade, N.B.

Power house, for Jordon Sanitarium Commissioners, c/o Dr. Townsend, River Glade. Architect, F. Neil Brodie, Princess street, St. John. General contractor, R. A. Corbett, Douglas Ave., St. John.

Shawinigan Falls, Que.

Addition to power plant, for Shawinigan Water & Power Co., Power Bldg., Montreal. Builder and arch., owner's engineers. Steel, Phoenix Bridge Co., 83 Colborne, Dartnell, Ltd., 8 Beaver Hall Square, Montreal, supplying enamelled and vitrified brick. 80 ft. high, 40 x 112, steel and brick construction. Owner is general contractor.

For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where "the breezy call of incense breathing morn" will put new life in mind and body. Muskoka offers more real healthful enjoyment for less money than any other resort in the world.

Four cottages to rent $125 to $200 on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box 771,

Contract Record, Toronto Ont.

Telephone Junction 2342

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A. B. SILCOX,

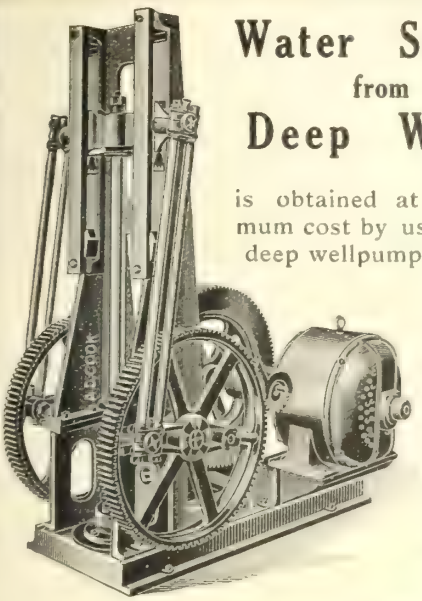
Standard Bank Building,
TORONTO

Tenders

A few dollars spent in advertising your proposals in the

Contract Record
and Engineering Review

would result in additional competition, which might save your city or town or your client many hundreds of dollars.



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Deep Wells

is obtained at a minimum cost by use of our deep wellpumps.

Write for Bulletin [illegible] explaining the use of Cook's Patent Brass Tube Well Strainer

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Lawrenceburg, Indiana, U. S. A.

Manufacturer of a Complete line of **DEEP WELL SUPPLIES** including Steam, Belt and Motor Driven **DEEP WELL PUMPS**, Wind-mill and Hand Pumps, Working Barrels and Valves, Pump Rods and Pump Rod Joints, Drill Rods and Drill Rod Joints, Drilling and Well Tools.

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Quarries and Mills at Bedford, Indiana, and Bloomington, Indiana
Producers of Dark Hollow Buff and Blue
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from our quarries has been used in many of the largest public buildings, churches, etc., in the United States and Canada.

Mill blocks, sawed, planed and turned stone of every description furnished on short notice. Write for information.

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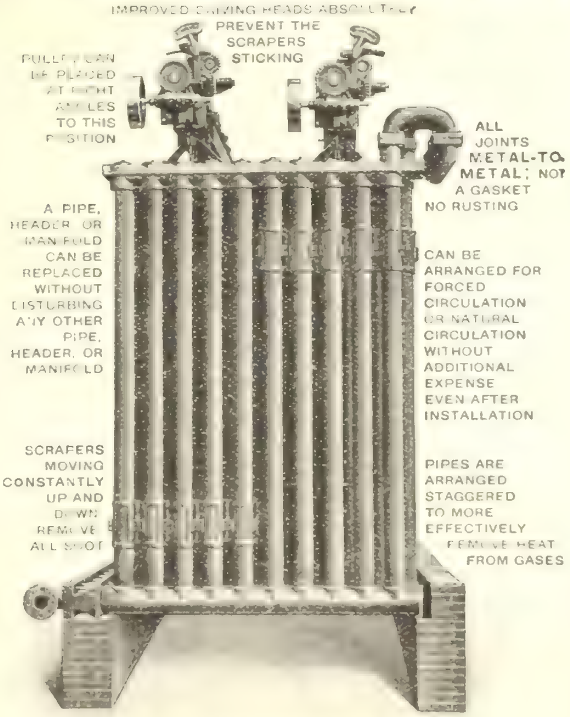
The Patented Constructional Features of the
Sturtevant
(REG. U. S. PAT. OFF.)
FUEL ECONOMIZER


IMPROVED DRIVING HEADS ABSOLUTELY PREVENT THE SCRAPERS STICKING
PULLEY CAN BE PLACED AT RIGHT ANGLES TO THIS POSITION
ALL JOINTS METAL-TO-METAL; NOT A GASKET NO RUSTING
A PIPE, HEADER OR MANIFOLD CAN BE REPLACED WITHOUT DISTURBING ANY OTHER PIPE, HEADER, OR MANIFOLD
CAN BE ARRANGED FOR FORCED CIRCULATION OR NATURAL CIRCULATION WITHOUT ADDITIONAL EXPENSE EVEN AFTER INSTALLATION
SCRAPERS MOVING CONSTANTLY UP AND DOWN REMOVE ALL SOOT
PIPES ARE ARRANGED STAGGERED TO MORE EFFECTIVELY REMOVE HEAT FROM GASES

It has the Patented constructional features; the Metal-to-Metal joints which never leak; require no gaskets and allow high pressures; the positive Scraper Mechanism which never sticks; the interchangeable scraper and the specially designed pipe joints which have caused the almost exclusive use of STURTEVENT Economizers in every large important economizer installation during the last two years.

The following are but a few of the orders received during the past year:

Cleveland Illuminating Co.,	9,000 B.H.P.
Commonwealth Edison Co.	10,500 "
Commonwealth Edison Co., Second Order -	10,500 "
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Delaware & Hudson River R. R. Co. - -	2,000 "

The construction of these economizers is fully described in our catalog No. 150Z sent upon request.

B. F. Sturtevant Company
of Canada, Limited
304-306 University St., Montreal, P.Q.

HOISTING ENGINE REPAIRS

We carry a full line of repair parts for our hoisting machinery at all times. Prompt shipment made on anything you require.

Send for Descriptive Sheet showing Parts and number to order by.

Hoists of all kinds, Winches and Derrick Irons supplied on shortest notice.

SALES AGENTS
MUSSENS
LIMITED
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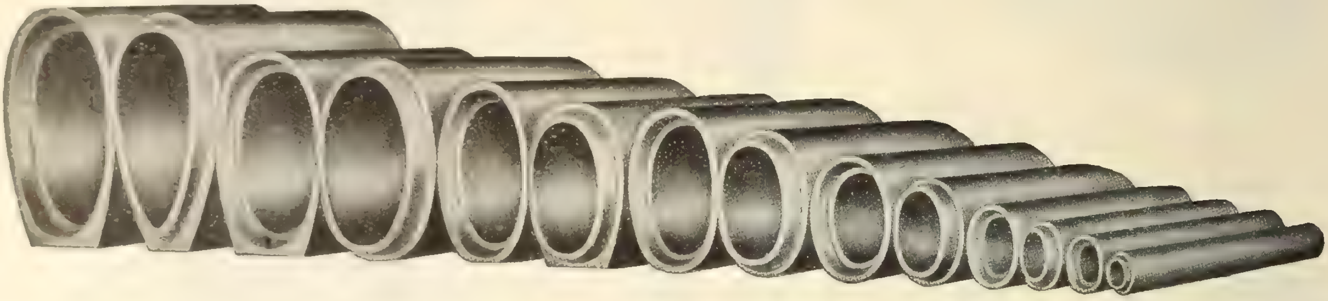
MARSH & HENTHORN LTD.

Makers of Hoisting Machinery, BELLEVILLE, ONT.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS.
NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario

EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited

Galt, Ontario, Can.

Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
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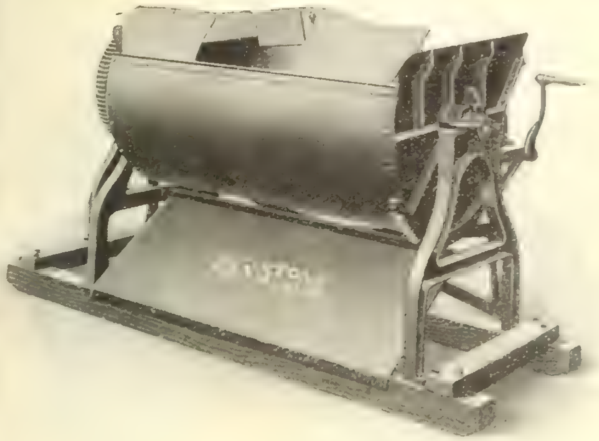
Time Saved in Concrete Mixing



The Blystone Skid Mixer

Every movement of this mixer is calculated to save time. The mixing is quick and thorough and the dumping, worked by the handle on the right will save moments at every batch turned out. Strongly built—all working parts carefully balanced.

The Blystone Machinery Company
63 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
Contractors Department No. 1, TORONTO, CAN.
Sole Distributors for Canada

"Metallic"

Corrugated Iron

"Metallic" is the only corrugated iron that actually has deep corrugations. We make our corrugated iron from sheets of especially made metal that holds its shape, and the corrugations remain straight and true indefinitely. Ask us to send you all the facts about our corrugated iron. Metal experts—men who know—specify "Metallic" when ordering corrugated iron. Let us tell you why. We can supply you with either galvanized or painted sheets, flat or curved.

THE METALLIC ROOFING CO.
OF CANADA LIMITED.
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by
International Marine Signal Co. Limited
Ottawa, Canada

FOR SALE

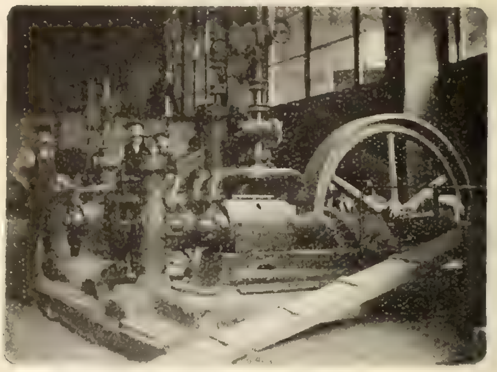
1—10 x 16 Standard Gauge Porter Locomotive
1—12 x 15 Waterous Slide Valve Engine
1—6 1-2 x 8 American D.C. D.D. Hoist with Swinger
1—7 x 10 Lambert D.D. Hoist
1—10 x 12 Beatty D.C. D.D. Hoist with Swinger
1—5—Ton Tandem Roller
1—20 H.P. Waterous Portable Boiler
1—30 H.P. Locomotive Boiler on Skids
5 Rock Drills
1 No. 2 Smith Concrete Mixer
1 No. 2 Milwaukee Concrete Mixer
1 15 H.P. Upright Boiler

The above machines are but slightly used and are in good working order.

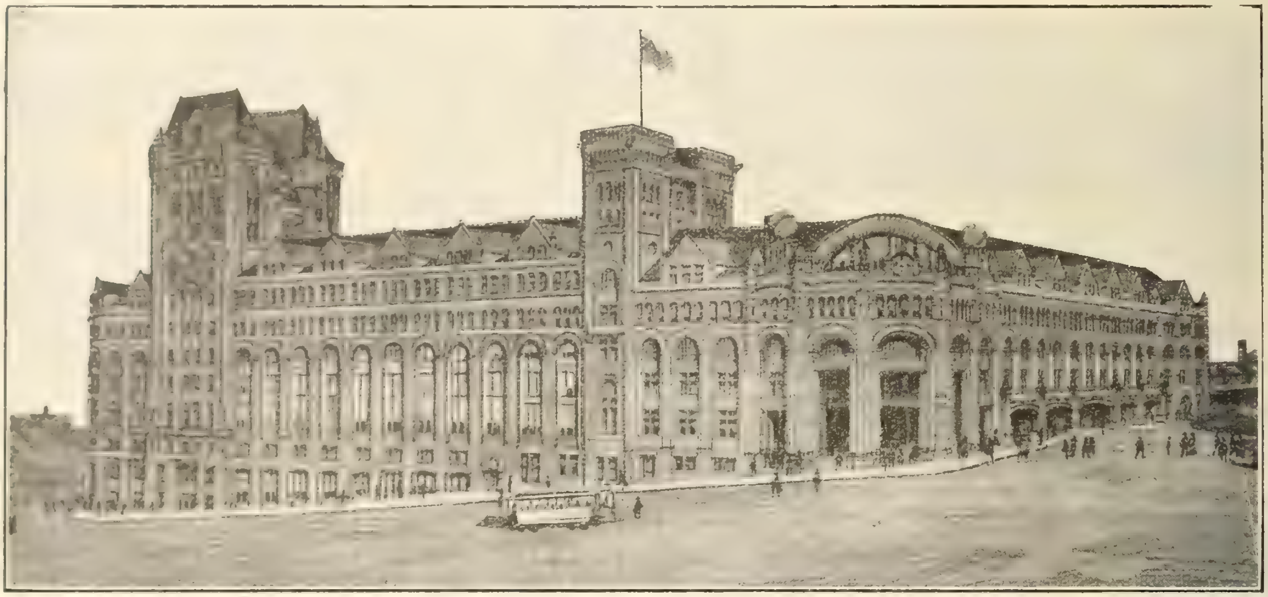
Fleming Machinery Company
340 Sparks Street, Ottawa, Ont.

THE LINDE BRITISH REFRIGERATION COMPANY LIMITED

has the largest output in the world of refrigerating machinery.



Plant in course of construction at Windsor Station



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The largest contract for installation of refrigerating plant in any hotel or railway station in Canada

Established in Great Britain 27 Years. *Established in Canada 18 Years.*

Operating in every country in the world, with plants or distributing offices at

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CORISTINE BLDG
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A Look Backward

may be taken, with profit, by those interested in ***permanent*** road surfacing. Trinidad Asphalt has long been known as one of the two most stable and dependable paving materials in existence. A primary form of this lake asphalt, with all of its stability, is

Trinidad Liquid Asphalt

A permanent constructive agent Not a mere dust layer

Trinidad Liquid Asphalt, applied hot or cold, ***stays in the road*** and builds up a durable bituminous surface. Trinidad roads are entirely free from the objections to "oiled roads." The reasons why are made plain in our booklets. Ask for them.

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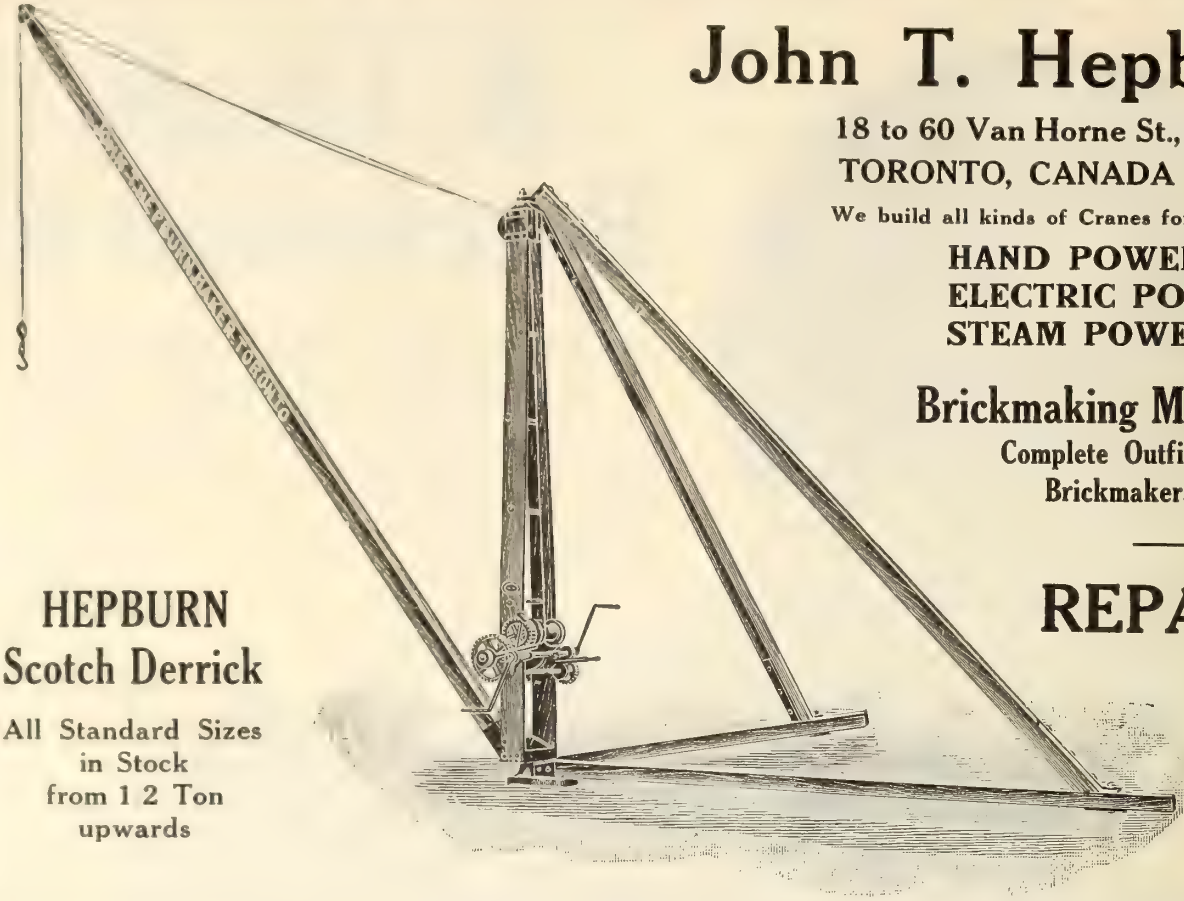

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TORONTO, CANADA

We build all kinds of Cranes for

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Brickmaking Machinery

Complete Outfits for
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REPAIRS

HEPBURN
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All Standard Sizes
in Stock
from 1 2 Ton
upwards

Looking for the "Maple Leaf"

MAPLE LEAF
BELT DRESSING
DOMINION BELTING CO.
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Is the BEST
for all kinds
of BELTING

Has Become a Habit with Superintendents and Engineers

The reason is not hard to find, for there is no part of your Belting system, from the main drive to the smallest light Belt for power transmission, where you will not get the best kinds of service from

"Maple Leaf" Brand
Stitched Cotton Duck Belting

It is the most economical Belting because it is durable under every condition; even where other Belting will deteriorate rapidly. It is water proof.

It runs absolutely true on the Pulleys.
It is built of plies of selected duck.

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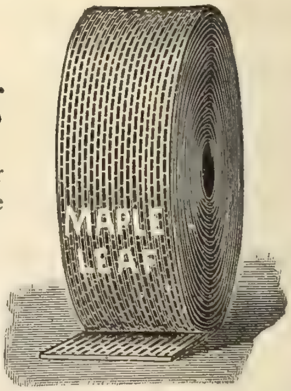

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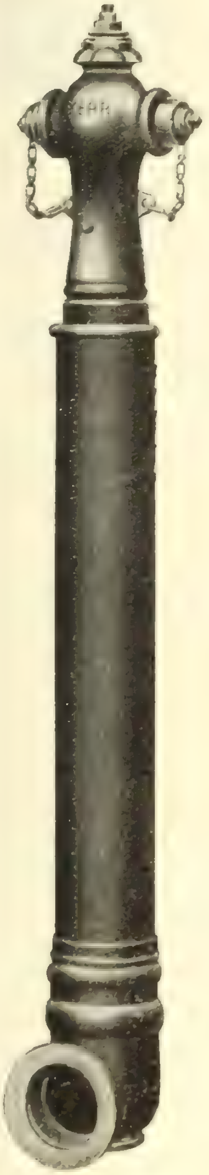
KERR



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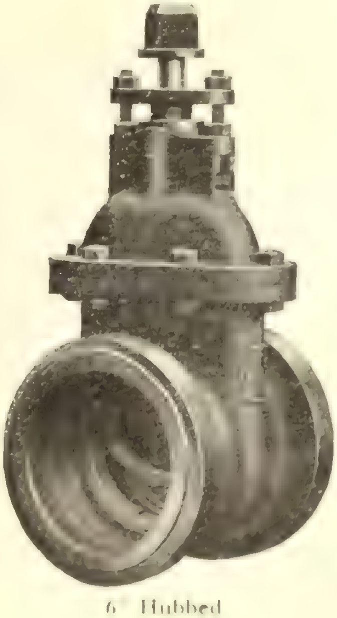
are made with Hub for Cast Iron, Wood or Steel pipe spigots. They have full area of waterway, and are strong, compact and modern in design and construction.

Standard Compression Hydrant

Send us your Specifications and Enquiries.

Prompt attention given.

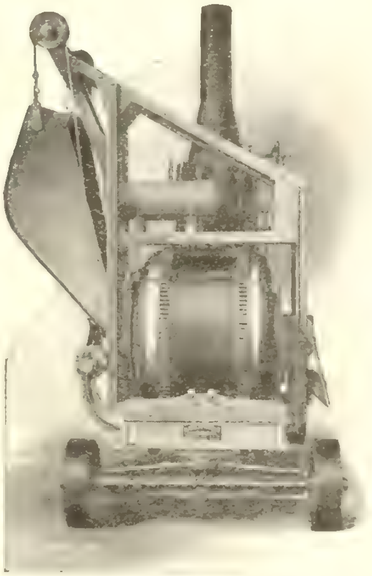


6" Hubbed

THE KERR ENGINE CO.
LIMITED
WALKERVILLE, ONT.

The Mixer That Lasts

The Koehring "3 in 1"



We know that concrete mixers get hard service—and so we build THE KOEHRING to *stand* hard service.

We do it by putting the right kind of material into every part of THE KOEHRING—and *enough* material.

It ruck, for instance, is very rugged; it is made with a full 100% safety factor of strength.

Then here are features of design that add greatly to its lasting qualities.

For instance the rollers in THE KOEHRING are keyed onto the shaft *exactly as in a railroad truck*, preventing rapid wear of trunnion rollers and runaways and disalignment of drum, the cause of so many mixer troubles.

Our very complete side loader can be raised to an almost vertical position, so discharging into the drum *without pounding the bucket.*

Don't buy until you have investigated all these detailed superiorities of THE KOEHRING. The few points outlined here are but indications of the many you should know about.

The Koehring "3 in 1" Mixer Book No. 18 Gives Full Details

Glad to send you a copy

Koehring Machine Co.
Milwaukee, Wisconsin

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LIMITED, Toronto, Montreal, Halifax, Ottawa, Cobalt,
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By
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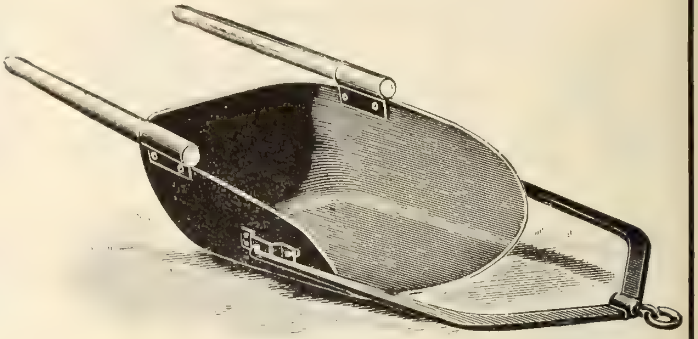
The Best Value for Your Money



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Our DRAG SCRAPERS have pressed bowls of high carbon steel—all joints and seams being eliminated. They are stiff and serviceable. WHEEL SCRAPERS can be supplied with either square pan or pressed bowl, and have the latest and most approved dumping attachments.

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IRON AGE

Our STEEL TRAY BARROWS with trays pressed from solid sheets of high carbon steel, without seams or joints, are the standard with all the leading contractors.

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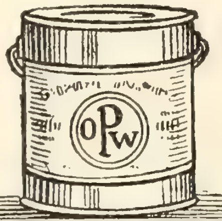

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Color cards free for the asking

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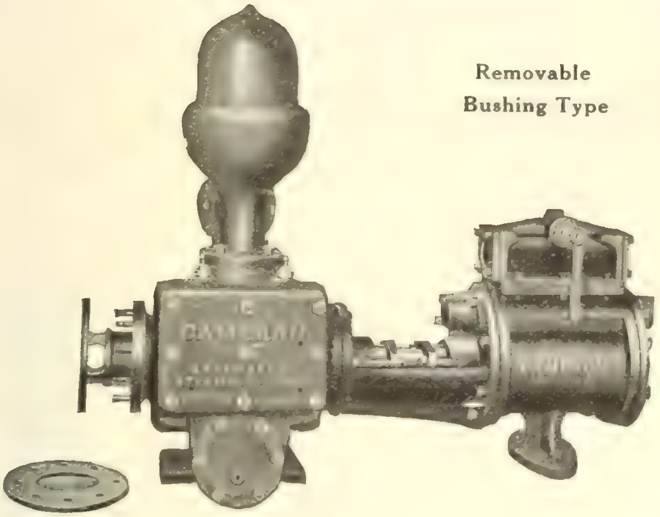
AND OTHER INFORMATION

Hard Service Has Given



Removable
Bushing Type

Cameron Pumps

Their Reputation

The Slogan of the Cameron—
"Character: The Grandest Thing."

Where other pumps fail the Cameron Pump makes good as it is unusually strong and durable.

This is a fact recognized everywhere by practical contractors. The Cameron is always efficient in ordinary everyday service, but it is the conditions and unusual service that have proved its extra efficiency and have given it the great reputation it enjoys.

The Removable Bushing type is the pump for general contracting. The bushing can be turned as it wears and actually extends the life of the pump indefinitely, as a new bushing can be substituted with out even raising the pump to the surface.

In stock together with parts at Sherbrooke and branch warehouses.

CANADIAN INGERSOLL-RAND CO., LIMITED.

COMMERCIAL UNION BUILDING, -:- MONTREAL, CANADA.

Works: Sherbrooke, Que.

Sydney Montreal Toronto Cobalt South Porcupine Winnipeg Lethbridge Nelson Vancouver

Get
Our
Prices
They
are
Right

PROMPT SHIPMENT IN

BOILERS

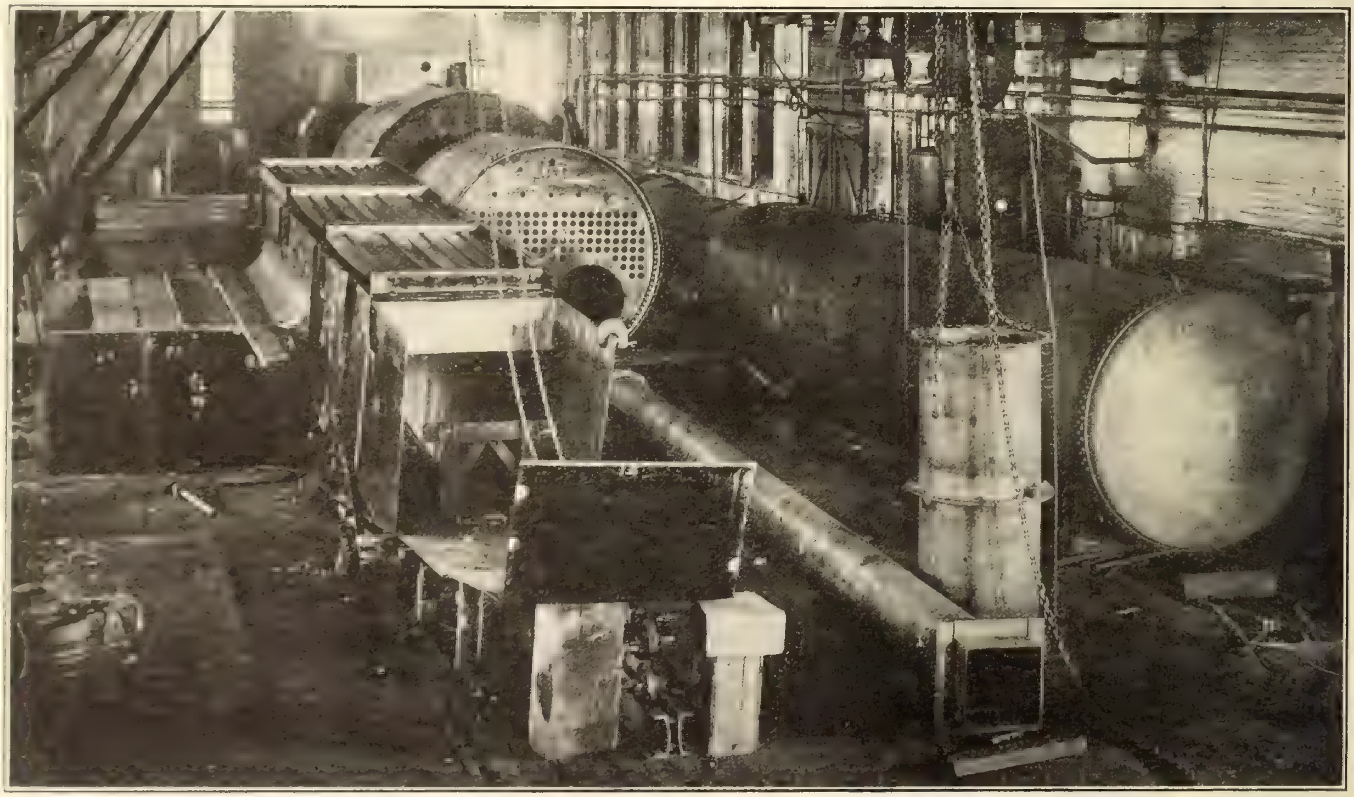
Water Tubes

Horizontal Return Tubular
Fitzgibbons, Scotch Marines,
Scotch Drybacks

Steel Water Towers, Tanks and Heavy Plate Work.
Cast Iron Columns and Bases. Post Hangers

Buy
Berg

They
are
Best



A small section of our Boiler Shop
showing a few Marine Boilers
under construction.

The Berg Machinery Mfg. Co., Limited

Boiler Department

Bathurst and Niagara Sts. **TORONTO, ONTARIO**

ELECTRICAL

Wires and Cables

In

Copper and Aluminum

Copper Clad (Duplex Metal) Wire

Galvanized Steel Strand for Guys

Canada Wire & Cable Co., Limited

1170 Dundas St., Toronto

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"The Small Job Money-Maker"

You can make more money with this Concrete Mixer than with many of larger capacity and greater cost. Mixes 5 to 30 cu. yds. per day on one gallon of gasoline—many contractors far exceed this. Saves 50 cents per cu. yd. over hand work.

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Send for our "Man to Man" proposition NOW, while you are thinking about it.

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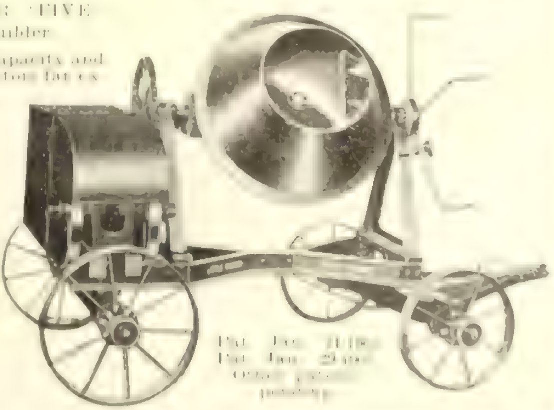

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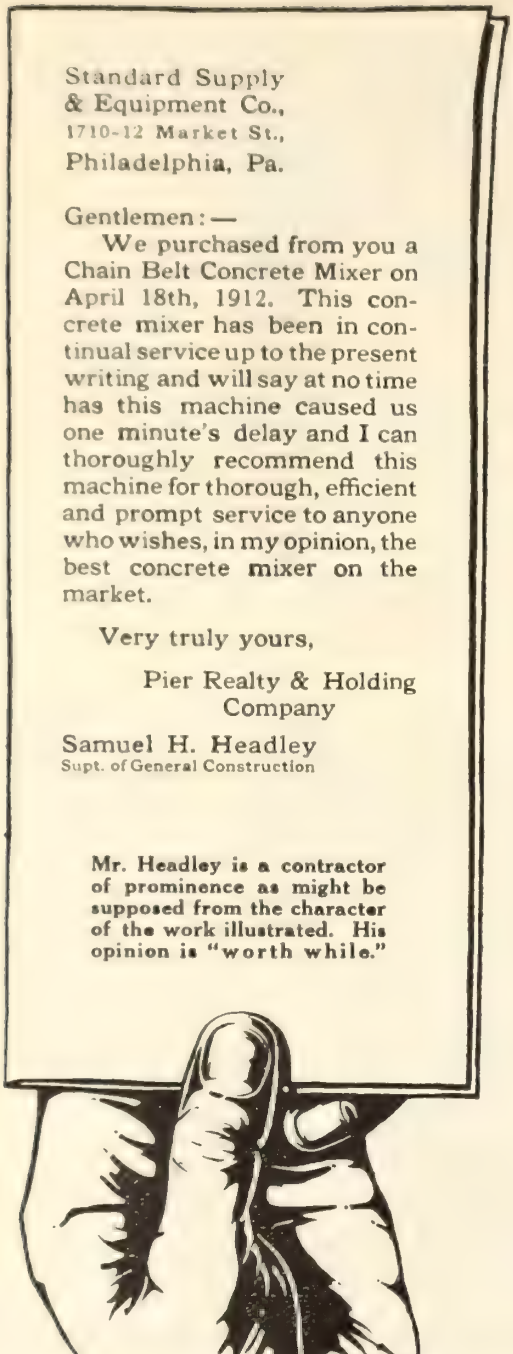

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The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

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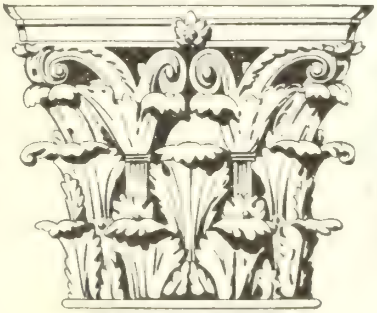

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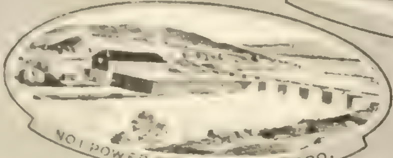
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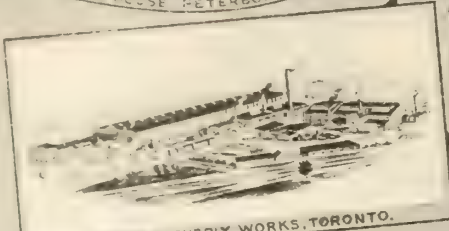
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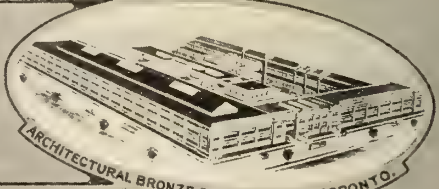
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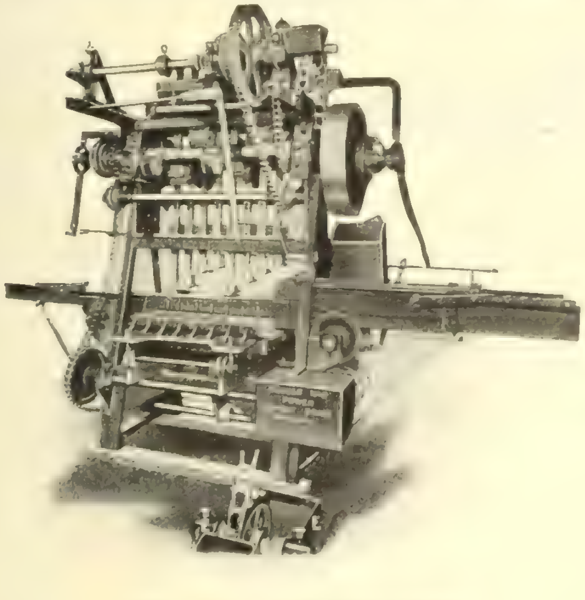

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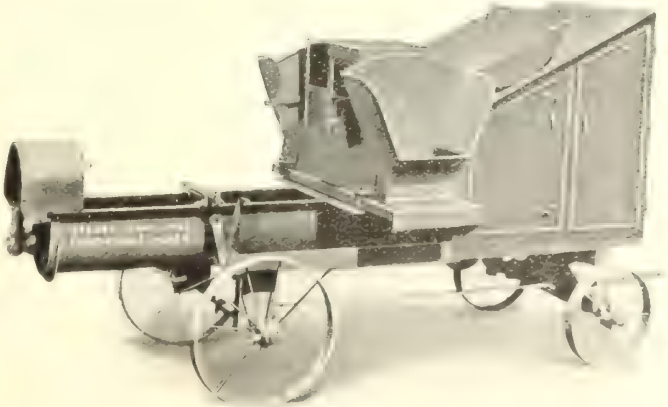

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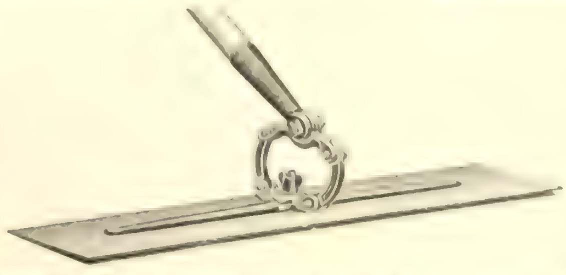

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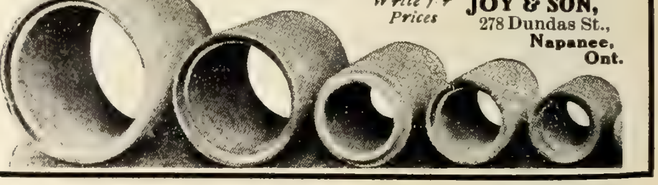

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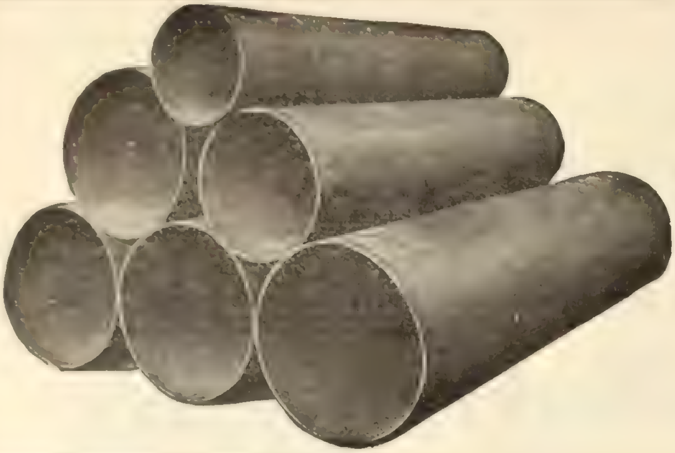

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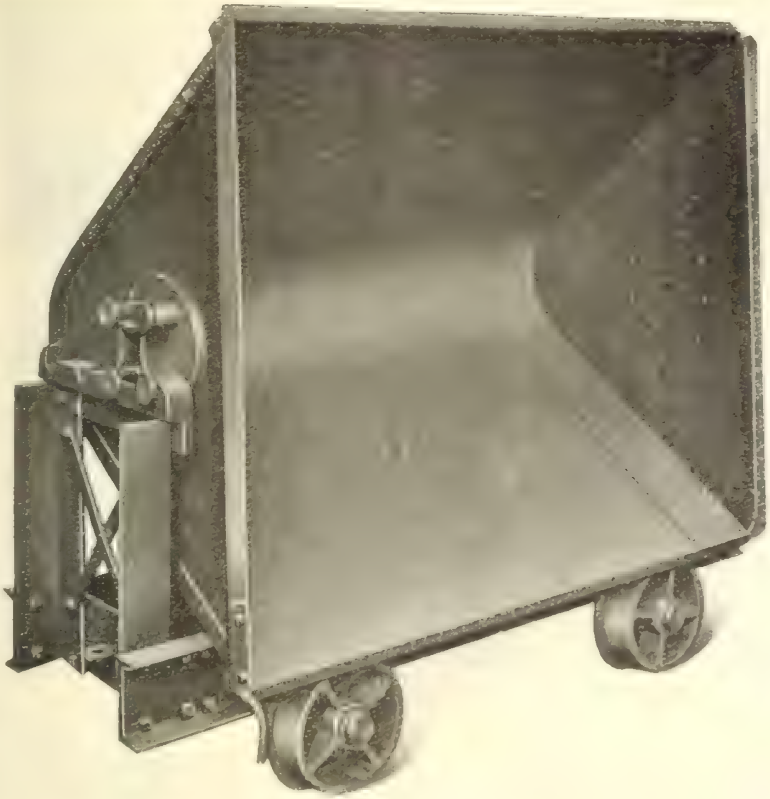

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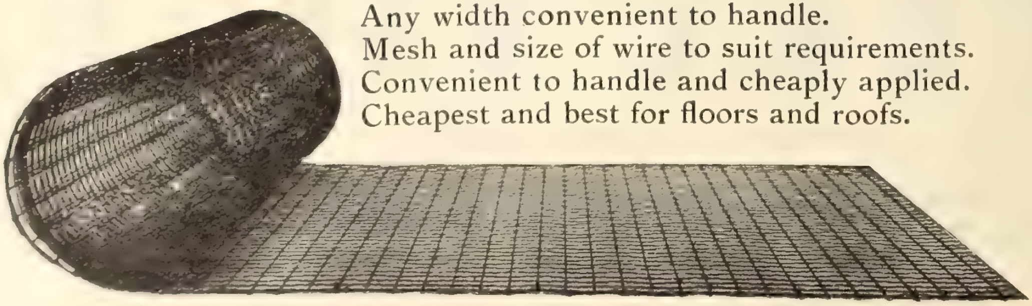

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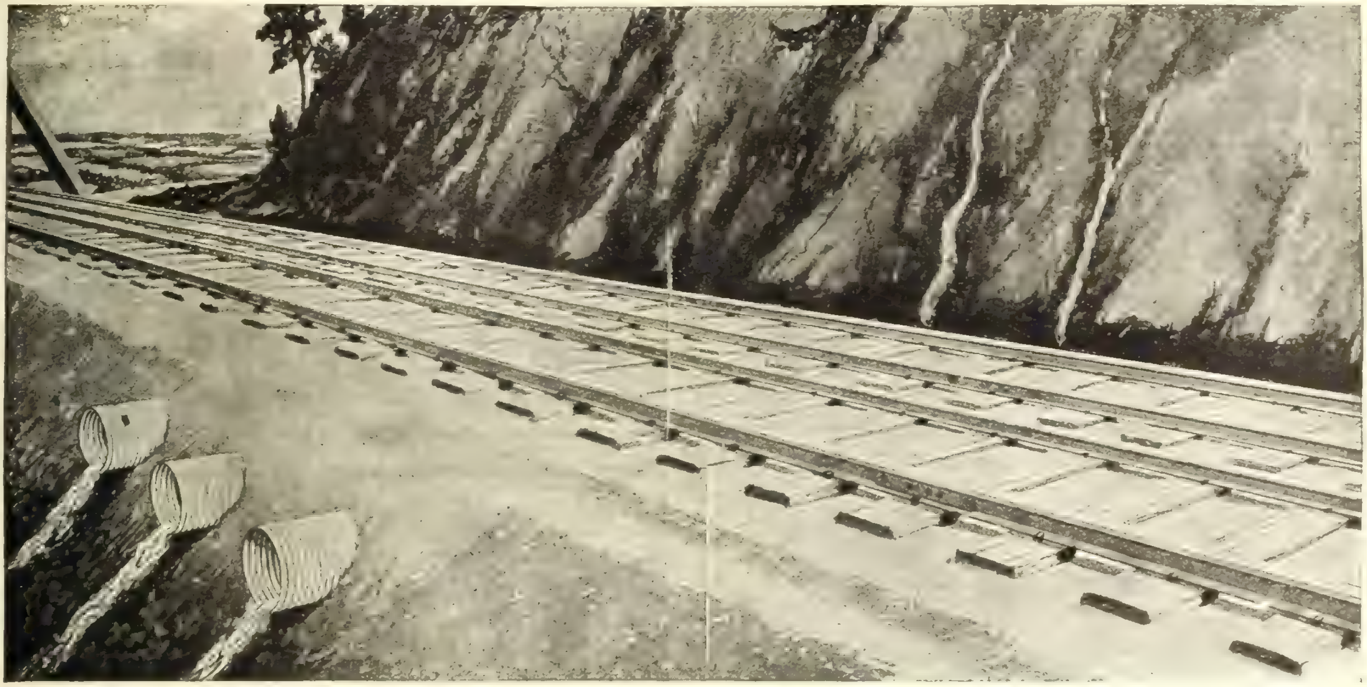

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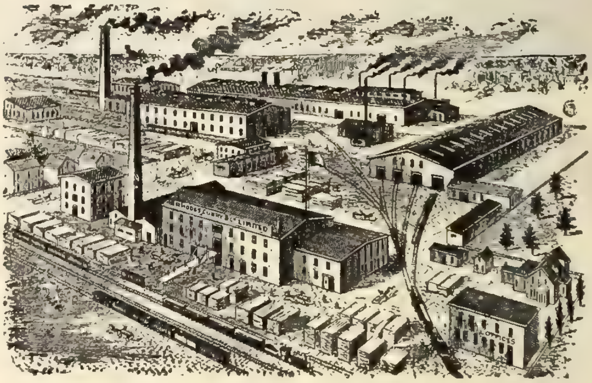

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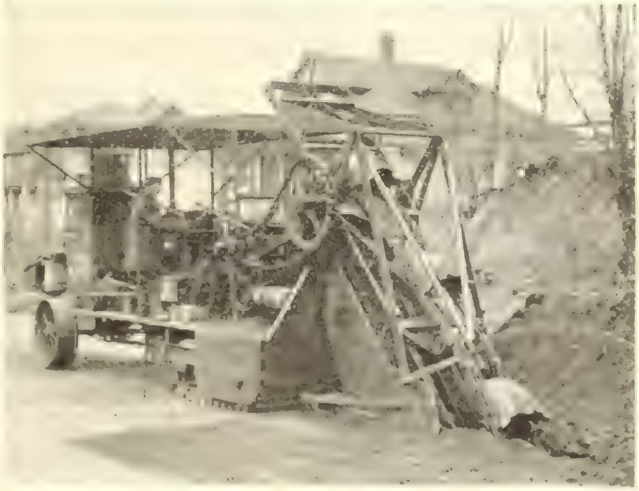

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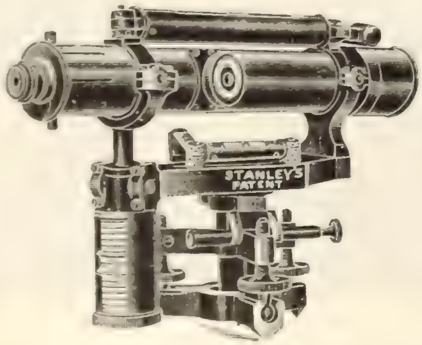

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Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

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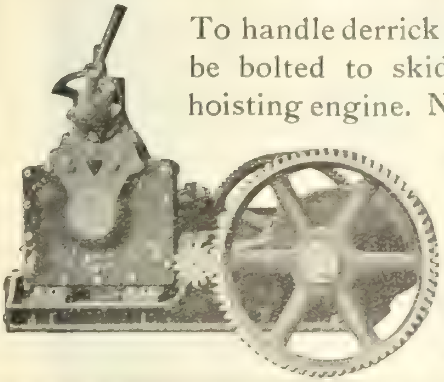

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Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 [illegible] pressed red brick	$18 00
No. 1 [illegible] pressed buff brick	18 00
Red Stock Bricks	13 00
[illegible] Stock Bricks	13 00
Wire cut bricks for foundation work	12 00
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving	36 00	42 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51 60	4 75	7 00
61 70		8 00
71/80		9 00
81 85		10 00
86 90		11 00
91 95		13 00
96 100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 15 per cent.; lead waste, $9.00, less 15 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 40 per cent.; pig lead, 5c lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

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Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

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Boiled Linseed Oil in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

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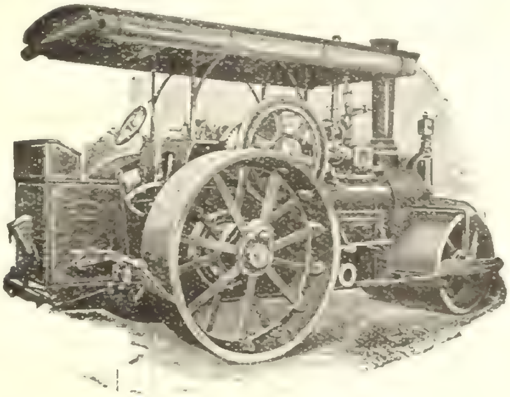

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F. W. THOROLD CO., LIMITED

CONSULTING ENGINEERS

CONTRACTORS

2 TORONTO STREET **TORONTO**

The

Laurentian Granite Co.

Limited

MANUFACTURERS OF

Building Granite, Granite Setts, Curbing, Crushed Granite

Samples Furnished and Prices Quoted on Application

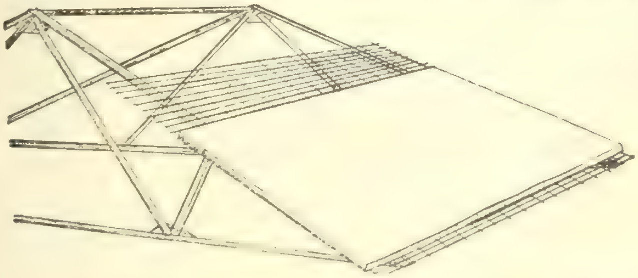
Rose and Pink Granite Quarries at Staynerville, P. Que., Co. Argenteuil, on C.P.R.

Bank of Ottawa Bld'g, 224 St. James St. **Montreal**
Bell Tel. M. 4354

Canada Lumberman & Wood Worker

Toronto, Canada

Concrete Reinforcement



Our Bonding is a Crimped STEEL WIRE Fabric

Can be made in any Length or Width to suit you.

We claim in the erection of roofs and floors our continuous reinforcement has no superior, inasmuch as it knits the entire mass into an actual monolithic slab, weak at no point and so tied together that in case of accident from any cause whatever, no single section would fall but would be sustained by carrying capacity of wires running in continuous lengths over top of roof trusses or purlins.

Enquiries solicited

When in Need of——

Ornamental

Wire and Iron Work

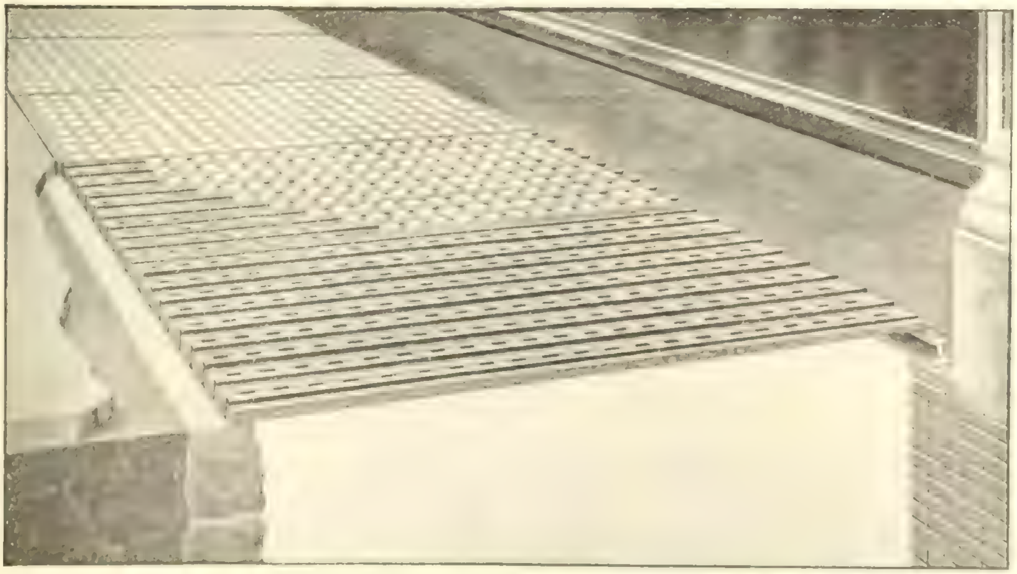
SEND US YOUR ENQUIRIES

We specialize in

Jail and Prison Work

Canada Wire & Iron Goods Co., Hamilton

Simplex Double Reinforced Vault Light Construction



We guarantee this construction to be free from leakage and shaling of the glass.

Sole Canadian Agents and Manufacturers of

SIMPLEX
NU-PLAN
BAR LOCK
3-WAY
QUICK-SET
SIDEWALK
PRISM CONSTRUCTION

HOBBS MANUFACTURING CO., LIMITED

LONDON TORONTO MONTREAL WINNIPEG

The Owen Sound Iron Works Co., Limited

Owen Sound, Ontario

Engineers, Boilermakers, Machinists, Founders

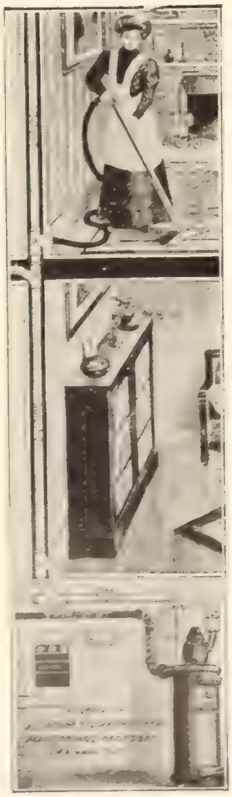
Manufacturers of

Emerick Ball Pulverizers, Emerick's Separators, Vibrating Screens, Tube Mill Feeders, Cement Manufacturing Machinery, Rotary Kilns, Ball and Tube Mills, Engines and Boilers, Dump Cars, Smoke Stacks and Tank Work, Grey Iron and Brass Castings, Heaters and Purifiers

Special attention given to Cement Mill Machinery Repairs, Cleaning and Welding Boiler Tubes

Steel Plate Work, STRUCTURAL STEEL and Municipal Bridge Work

We solicit an opportunity to tender on any work in the above lines



'Tis Air that Cleans

Vacuum Cleaning Installations

REQUIRE

At the Tool

The following ***minimum*** Specifications

FOR

Good Quick Cleaning
60 Cubic feet per Minute
.8 inch Vacuum

TUEC STATIONARY AIR CLEANING SYSTEM

CANADIAN TUEC DISTRIBUTORS
Tuec Co. of Winnipeg—419 Portage Ave., Winnipeg, Man.
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Tuec Co. of Montreal—406 New Birks Bldg., Montreal, Que.
Canadian Factory—B.O.T Building, 159-61 Richmond St. W., Toronto—Jas. J. Martindale

A Canopy, A Business-Getter

EXPERIENCE has proved that a canopy over a store window is one of the best business-getting agents that can be employed. It also adds to the value of the building and enhances its appearance. Erect

A Luxfer Canopy

on the stores or buildings that you are planning. We will submit designs or follow your design.

Luxfer Prism Co., Ltd.
100 King Street West, TORONTO

Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.

Cut shows an all-steel building used for storing expensive patterns and dies. The size of this is 18′ x 39′ and it has been doing service for years and gives the same good service as when erected.

The Metal Shingle & Siding Company, Ltd.

Associated with
The A. B. Ormsby Company, Limited
Montreal, Toronto, Preston, Winnipeg,
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STEEL PIPES
Welded or Rivetted

WITH ANY TYPE OF JOINT
AND FOR ALL PURPOSES

GAS, WATER, SEWAGE, STEAM, Etc.

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Cables:
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BIRMINGHAM

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MANUFACTURERS OF

Stairways in Wrought and Cast Iron
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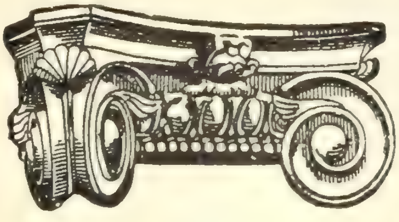
Balconies Window Grilles
Lamps and Brackets
Light Structural Iron Work

"Bull Frog" Wheelbarrows and Concrete Carts of all descriptions

Are you satisfied with your wheelbarrows, if not you can purchase the "Bull Frog" brand from Dominion Equipment & Supply Co. of Winnipeg, London Concrete Machinery Co., Ltd., London, Ont. and E. P. Jamison & Co., Ltd., of Vancouver, and be assured of satisfaction.

THE TOLEDO WHEELBARROW COMPANY, TOLEDO, O., U.S.A.

Our Patent Wainscot Cement



Centre Pieces, Brackets, Veranda Capitals and Freizes. Claphams Grey Wainscoat Cement Finish for Bathrooms, Kitchens, Lavatories, etc.

JOHN CLAPHAM & SON
69 Hughson St., N., HAMILTON

PURE WATER

It is easy to obtain with our plants and apparatus

We design and contract for complete municipal filtration plants of any capacity.

We supply and install apparatus for sterilizing water supplies by the application of calcium hypochlorite.

Literature, Sketches, Estimates and Recommendations Supplied on Request

American Water Softener Co.
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We have no affiliations or working acquirements with any of our competitors.

Vault Doors and Safes

J. & J. Taylor
Toronto Safe Works
Established 1855 TORONTO
Branches: Vancouver and Winnipeg
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This is the man who saves the life of many a cement house. He makes the

Bay State Brick and Cement Coating

which prevents hair cracking from moisture, becomes a part of the material itself without destroying the distinctive texture of concrete or stucco and can be used equally well on brick or wood, and its dull, velvet tone gives a beautiful tint to interior woodwork in mills, garages and manufacturing plants; when applied overhead will never drop off and injure delicate machinery.

Don't fail to write for book M which tells about Bay State Brick and Cement Coating.

Wadsworth, Howland & Company, Inc.
Paint & Varnish Makers & Lead Corroders
82-84 Washington Street, Boston, Mass.
New York Office, 101 Park Avenue at 40th Street

It was used here

St. Marks Episcopalian Church.
Grand Rapids, Mich.

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Supervising Architects

Jas. Dickson, Pres. Geo. T. Dickson, Vice-Pres

Dickson Bridge Works Co.

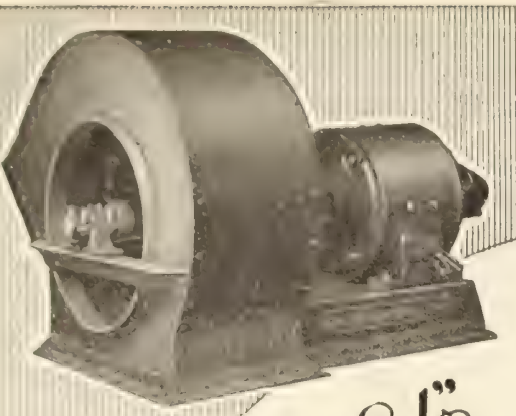
Campbellford, Ont. Limited

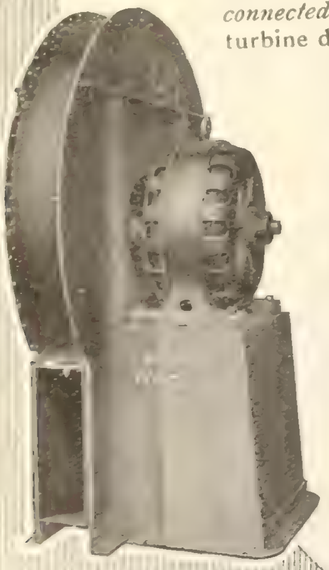
Bridge over Spanish River at Massey, Ont.

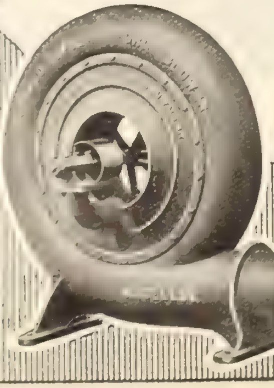
Steel Bridges, Steel Buildings Roof Trusses

and other Structural Steel

Foundry and Machine Shop in connection
Estimates on application







"Buffalo" Fans

For Heating, Ventilating, Drying and Exhausting.

Ask our engineers to recommend the fan best suited to your requirements. Our designs include the new high-efficiency "*Conoidal*" multiblade fan, used extensively for heating systems, mine and tunnel ventilation, and the motor-driven *Steel Plate Pressure Blower*, giving pressures up to 24 oz. Both of these designs show higher efficiency than obtained with any similar types. We specialize in *direct-connected* units (motor, engine or turbine driven) for every service. These are distinguished by absence of belt troubles and the very lowest power consumption. Whatever your problem write us.

CANADIAN BUFFALO FORGE CO., Limited
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Structural Water-proofing

"DEHYDRATINE"
For Water-proofing under the membranous method.

"HYDRATITE"
For Water-proofing Concrete.

"FERRO FAX"
For Surface Hardening Concrete Floors.

"SYMENTREX"
A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
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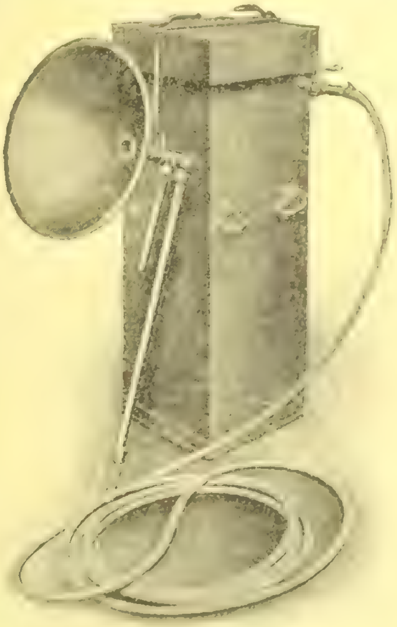
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

5,000 to 12,000 Candle Power at 5 cents Per Hour

How is that for cost? Can you beat it with any other light? The Milburn Acetylene Light is cheaper than oil or arc lights and just as simple as gas in your own house.



The Milburn Light shown here has a 15-inch aluminum, non tarnishing reflector, with absolutely storm-proof burner on swing joint, and 25 feet of armored hose and connections. It has a water-tight cover and is made to withstand hard usage, the vibration and movement of wrecking cars, cranes, steam shovels, dredges, etc. The light follows the crane or shovel and throws its rays directly upon the work.

THE MILBURN LIGHT

is made by water and carbide, burns more than half air, and requires no attention during use. Most of the fittings are of standard sizes, obtainable anywhere. It lights instantly and is absolutely safe. Tens of thousands of these lights are in constant use by all classes of users and not a single accident has ever been reported. They are now being used on all kinds of construction work in all parts of the world. Up-to-date contractors swear by them. You had better get acquainted with the Milburn Light.

Ask for Catalog No. 15.

The Canadian Fairbanks-Morse Company, Limited

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Calgary Saskatoon Vancouver Victoria 7

ADANAC RED CORE RUBBER COVERED WIRES AND CABLES

RUBBER COVERED
TRADE
ADANAC
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WIRES AND CABLES

Are made according to the specifications of the National Board of Fire Underwriters. The conductors are drawn from copper of the highest conductivity and are covered with two thicknesses of thoroughly vulcanized rubber compound of high quality. The wires are braided over insulation and the smooth high finish they receive makes them specially desirable for conduit work.

IMPERIAL WIRE AND CABLE COMPANY

Limited
MONTREAL

THE Northern Electric
AND MANUFACTURING CO LIMITED
Sales Agents

TORONTO REGINA WINNIPEG
CALGARY EDMONTON VANCOUVER

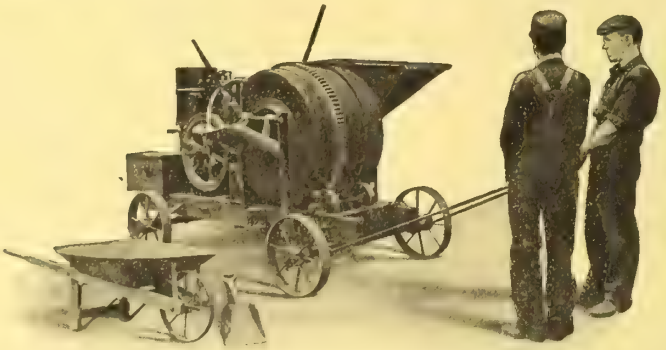
Everybody Who Builds

Concrete Walls, Concrete Walks or Curbs, Concrete Anything

can have the best Concrete that can be made at the least possible cost

BECAUSE

Our No. 4 RANSOME MIXER



No. 4 Ransome Concrete Mixer.

is the equal of our larger machines in efficiency and is sold at a price which makes it an easy and a wise purchase for anybody.

It has a batch capacity of 4 cubic yards per hour, which is ample for any small concrete job. No. 4 Mixers are sold in one way only : i. e.—mounted on Trucks, with gasoline engine, direct drive. This is a powerful engine for its rated H. P. and the best designed—a most perfect operating engine.

The No. 4 Ransome is a great time saver in every respect. As we equip these machines with a special batch charging hopper, which is being filled while the batch in the drum is mixing—no time is lost in charging drum. By the simple lever arrangement, the whole unmixed batch is fed into the drum in an instant and the loading gang keeps right on with their work without any waits whatever. The batch is instantly discharged by merely reversing the discharge chute.

Let Us Send You Particulars

F. H. Hopkins & Co.

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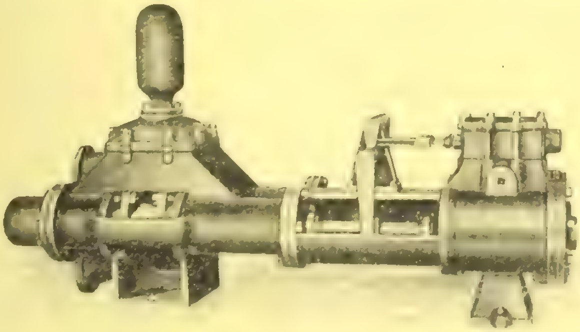
Special Feature: Practical Articles on Road and Street Work

ESTABLISHED 1886

Contract Record and Engineering Review

Vol. 27 Toronto, June 11, 1913 No. 24

Steam and Power Pumps
Condensers, Travelling Cranes



The Smart-Turner Machine Co.
HAMILTON, CANADA LIMITED

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited

(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND
SHEET
PILE DRIVERS

—Prove the Value of Experience.

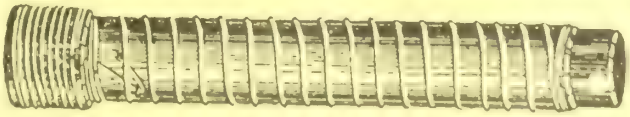
—Utilize all the Energy.

—Have Standard Mechanism.

—Are Handled with Facility.

Send for [illegible]

Canadian
Ingersoll-Rand
Co., Limited
MONTREAL, CAN.



Continuous and Machine Banded Wood Stave

WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited

P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

The
Doty Marine Engine and Boiler Co., Ltd.

Manufacturers of SUPERIOR
HOISTING ENGINES
Derrick Swingers, Material Elevators, Safety Mine Cages, Etc.
MARINE ENGINES BOILERS

This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.
Doty Engine Works Co. of Winnipeg, Ltd.
Foot of Water Street, WINNIPEG, Man.

EVERY JOLT AND JAR

of a heavily loaded derrick produces thousands of pounds of stress on certain parts.

"AMERICAN" DERRICKS

ARE SAFE AND STRONG

They are designed by skillful engineers and built of material that for 28 years has stood the severest shocks and strains.

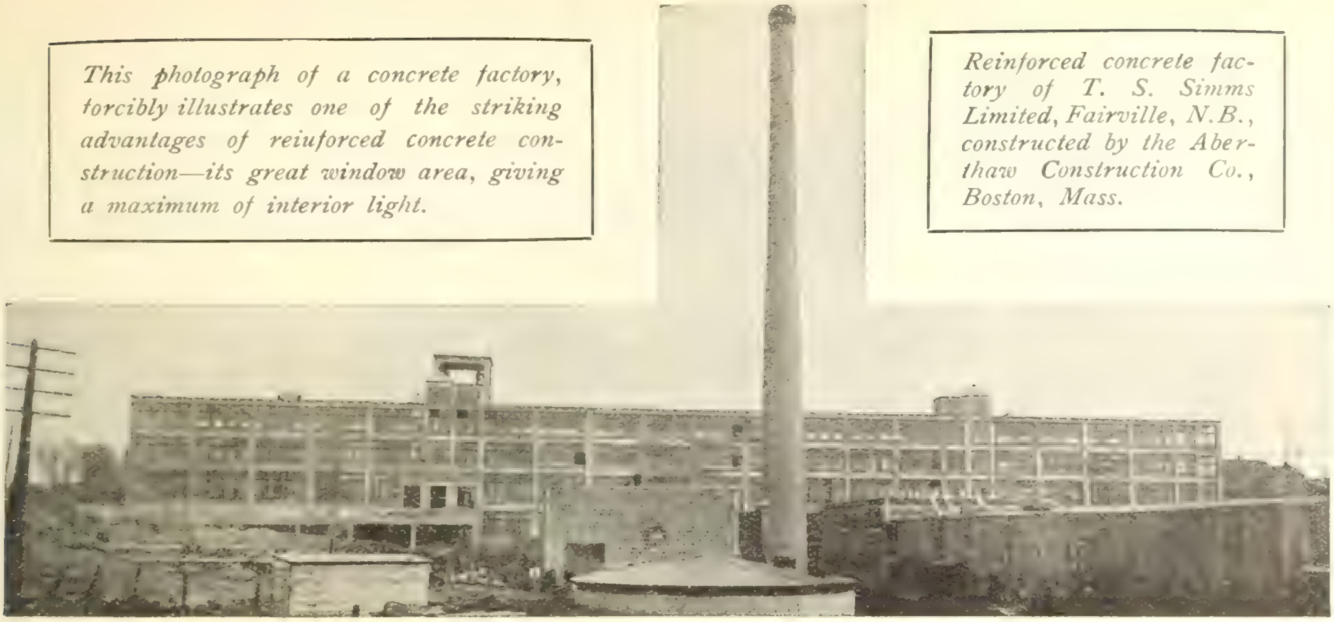
SEND FOR GENERAL CATALOG

American Hoist & Derrick Co.
ST. PAUL, U. S. A.

Gorman, Clancey & Grindley, Edmonton and Calgary, Alta. and Nelson, B.C,
Vancouver Machinery Depot, Ltd., Vancouver, B.C.
Stuart Machinery Co., Ltd., Winnipeg, Man.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reiuforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is **the ratio of** the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 221 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company

Limited

Montreal

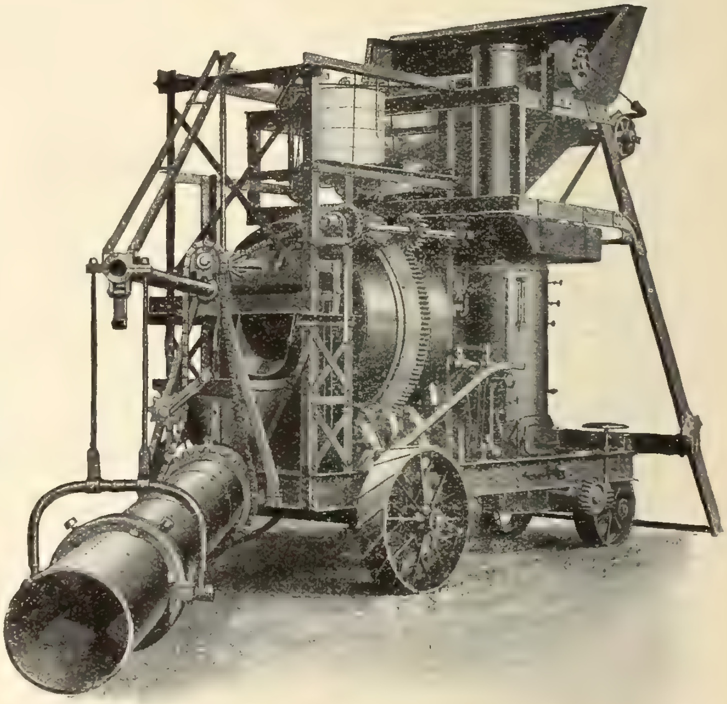
A Big Opportunity

For the Paving Contractor

The Chicago Street Paver

Embodies three features, long sought by street paving Contractors, viz:

Batch Mix
Continuous Discharge
Automatic Distribution



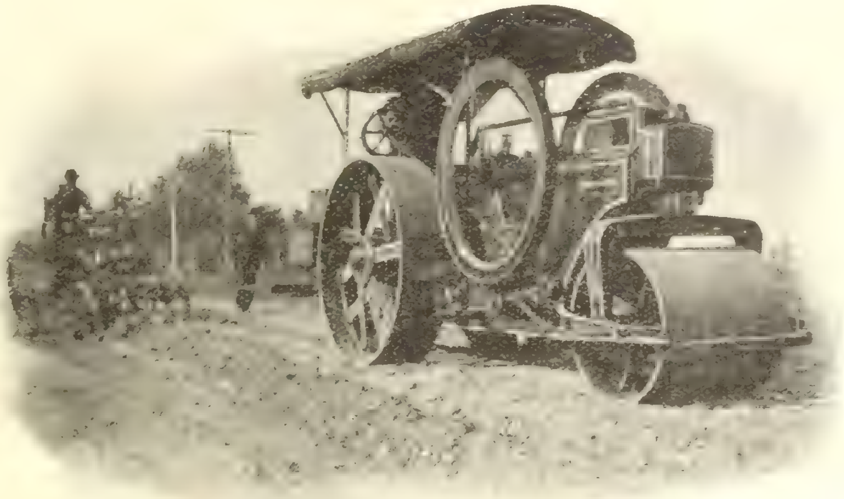
Has a daily output of 1500 square yards of 6 inch Base, with 16 men, and will cover a 36 foot street placing the concrete exactly where wanted without wheeling or shovelling.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

The Most
Economical
Motor Roller
on the
Market to-day
is the

AUSTIN
MOTOR
ROLLER



Easily Handled No Smoke, No Sparks, No Noise

RUSTON-PROCTOR
STEAM ROLLERS

have Compound Cylinders which effect a great saving in fuel consumption.

They are of English design, Material and Workmanship.

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Quebec, 71 Maple Ave.
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Canadian Boving Co.
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Inglis Co., John.
Jenckes Machine Co.
Laurie & Lamb.
Leonard & Sons, E.
McDougall Caledonian Iron Wks.
Mussens Limited.
Sturtevant Co. of Can. Ltd., B. F
Waterous Engine Works Co.
Wettlaufer Bros.

Engineers (Civil and Mechanical)
Bowman & Connor.
Campbell, R.
Chipman & Power.
Farmer, John T.
Galt Engineering Co., John
Lea & Ferguson.
Mitchell, C. H.

Expansion Bolts
Star Expansion Bolt Co.

Expanded Metal
Mannesmann Tube Co.

Exhaust Heads
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Field Instruments
Gurley, W. & L. E.

Filler, Floor and Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Ontario Lime Co., Ltd.
Smyth & Ryan.

Fireproof Doors and Windows
Metal Shingle & Siding Co.
Mussens Limited.
Ormsby, A. B.
Steel & Radiation Ltd.

Fuse (Safety Blasting)
Lecky & Collis.

Forges
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Furnaces (Special)
Improved Equipment Co.

Gasoline Engines
Wettlaufer Bros.

Gas Plants Complete
Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

Glass
Consolidated Glass Co.
Hobbs Mfg. Co.
Luxfer Prism Co.
Toronto Plate Glass Imp't'g. Co

Hammer Drills
Canadian Ingersoll-Rand Co.

Heating Apparatus
Canadian Buffalo Forge Co.
Canadian Sirocco Co.
Sheldons Limited

High Pressure Pipe Lines
Canadian Boving Co.
Escher Wyss & Co.

Hoisting Apparatus
American Hoist & Derrick Co.
Beatty & Sons, M.
Browning Engineering Co.
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Doty Marine Engine & Boiler Co
Jenckes Machine Co.
Hopkins & Co., F. H.
Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F.

Hoisting Engines
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

Don Valley Clay Products

For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Lumsden Building, Toronto

J. A. McKenzie, Architect. H. N. Dancy & Son, General Contractors.

Don Valley Fireproofing, Bricks and Tile used throughout.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

Traders Bank, Toronto

Carrere & Hastings and F. S. Baker, Associate Architects.

Don Valley Porous Terra Cotta Fireproofing and 2,000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Royal Bank, Toronto

Ewart G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

Bell Telephone Building

Adelaide Street, Toronto

W. J. Carmichael, Architect. [illegible] Limited, Contractors.

Don Valley Porous Terra Cotta Fireproofing and Brick used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

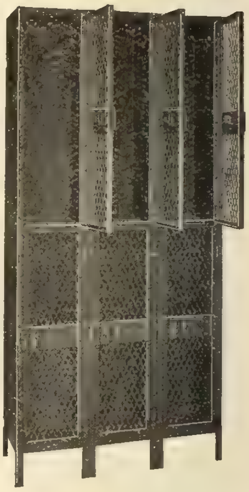
"STEELCRETE"
STEEL LOCKERS

"STEELCRETE"
STEEL LOCKERS

Locker Advantages

Wherever personal possessions must be left in the keeping of strangers, lockers provide the only really satisfactory arrangement of ensuring the safety of goods and the comfort of the possessor.

In waiting-rooms, dressing-rooms, cloak rooms, etc., lockers relieve those in authority of all responsibility of loss or damage and thereby form a permanent insurance against the many claims on property left in their charge.



"Steelcrete" Steel Lockers

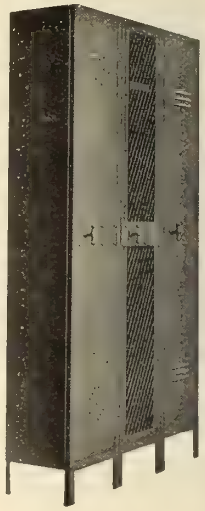
form a new type of safety lockers carefully thought out and designed and containing many advantages over the usual class of metal cage hitherto in use. These lockers are made all steel and are particularly suitable for

Warehouses, Gymnasiums, Schools, Clubs, Banks, Hospitals, Police Stations, Armouries, &c.

Steelcrete Steel Lockers are finished in olive green enamel and are exceptionally **neat** in appearance, **clean and sanitary,** and **solid** as a block of wood. They are constructed throughout of the finest high-grade steel and are unequalled for their Strength and Rigidity.

The Standard Sizes and fittings, etc., are carefully calculated to meet every ordinary requirement.

Made in "Single Tier" or "Double Tier" with sheet steel or expanded metal (open mesh) doors—combination locks or padlocks instead of rim locks if desired.



Write to Us—Our Prices will Interest You

STEEL and RADIATION

LIMITED

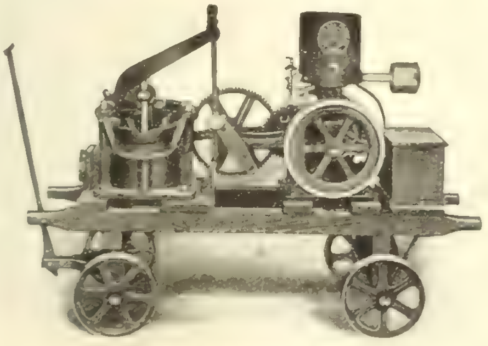
Toronto, Canada

"STEELCRETE"
STEEL LOCKERS

"STEELCRETE"
STEEL LOCKERS

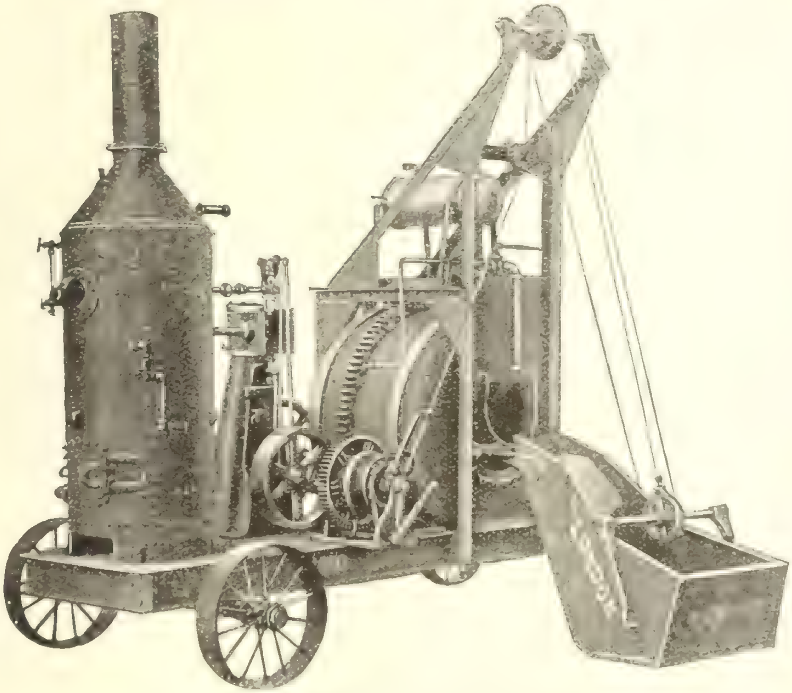
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



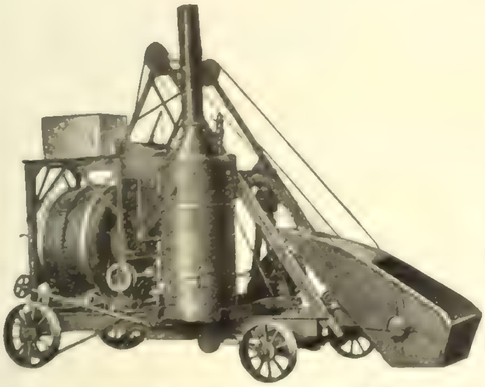
Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



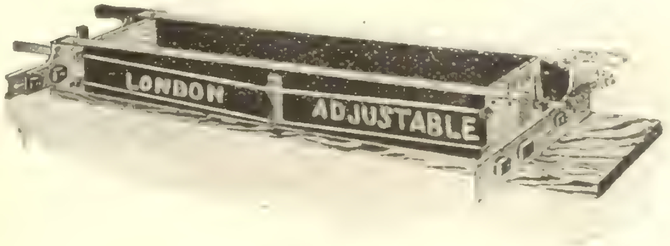
London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.



London Sill Step and Window Cap Mould

A few lines we manufacture

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.

AGENCIES:

VANCOUVER, B. C. Equipment Co. MOOSE JAW, SASK., Bridge & Iron Co., Ltd. REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co.

The Largest Manufacturers of Concrete Machinery in Canada

Wettlaufer Bro's
IMPROVED CONCRETE & ROAD MACHINERY

MIXERS

HOISTS

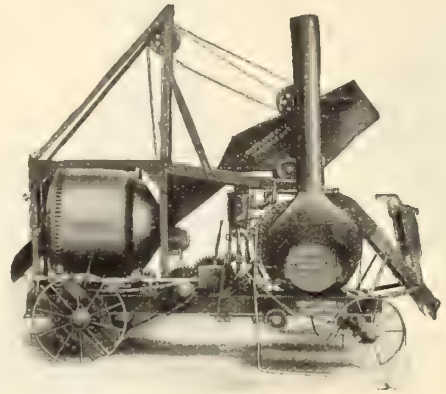
TILE MACHINES

BRICK MACHINES

CRUSHERS

PUMPS

We cannot give you any idea of the perfection of this mixer in an advertisement. If you are interested come and see the mixer—it is worth your while.



This is the "Maximum Efficiency" Mixer you are looking for—let us send you Illustrated Catalogue giving full description of it.

The Wettlaufer Story

No. 3

Some mixers will stand just so much and then give up—just so many days of steady hard wear and then break down. That's any man's luck, but for genuine downright exasperation give me the mixer that runs an hour and then stops of its own accord for a tap of the hammer or a turn of the wrench. There's lots of that sort around—they'll run a piece and then stop—keep the gang waiting doing nothing till they can be coaxed to go on.

Don't get caught with one like that. Save time, trouble and money—get a Wettlaufer Heartshape.

Wettlaufer Heartshape Mixers

will give the highest satisfaction in every day, all day work.

See the new Wettlaufer Heartshape Stationary Drum Traction Mixer with Horizontal Boiler. There are more points of advantage in this Mixer than in any other mixer on the Market.

Come and see it working—Continuous Demonstrations at

Wettlaufer Brothers

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

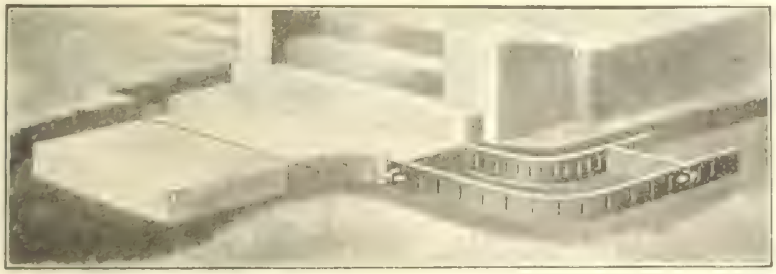
AGENCIES:

A. E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B. C. A. R. Williams Machinery Co., 15 Dock St., St. John, N. B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R. F. Mancill, 405 Cadogan Blk., Cal. The Hallman Machinery Co., 374 Alexander St. Vancouver, B. C. J. L. Lachampe, 363 St. Paul St., Quebec.

Montreal Office and Warerooms: 316 Lagauchetiere St. W.

THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

"Only Proper Way To Lay Sidewalks"



After supervising the construction of four miles of concrete walk, curb and gutter with Hotchkiss Lock Steel Forms at St. Lambert, Province of Quebec, Canada, A. S. Dickison, member of the Canadian Society of Civil Engineers, writes:

> "In my humble opinion it is the only proper way to lay sidewalks. Ours have been down through a Canadian winter and there was not a heave in four miles of it."

Hotchkiss Steel Lock Forms

reduce labor costs and entirely eliminate the lumber problem.

The amount you spend in one season for lumber for wooden forms will buy an outfit of Hotchkiss Lock Steel Forms that will last many seasons and give service over and over on a variety of work, such as sidewalk, pavement, wall and curb and gutter construction. So much for the economy of our forms.

Our forms secure perfect expansion joints, absolute alignment and a true surface, which you can't be sure of with wooden forms.

Curb and gutter and walk can be constructed in one operation with our forms, as shown in illustration of work at St. Lambert, Canada.

In addition to the many advantages of Hotchkiss Lock Steel Forms we give you the advantage of a special demonstration offer. You can try our forms on your own work at our risk. Write today.

Hotchkiss Lock Metal Form Co.

17 Hamilton Street, Binghamton, N. Y.

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

Ice-making Machinery
Linde British Refrigeration Co.

Iron Pipe
Walsh Plate and Structural Wks.

Insulating Compounds
Canadian Mineral Rubber Co.
Standard Underground Cable Co.
of Canada, Limited

Interior Finish and Doors
[illegible]
Canada Office & School Fur. Co.
Rhodes Curry & Co.

Kilns
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Co.
Berg Machinery Mfg. Co.

Lime
Jamieson Lime Co.
Ontario Lime Co., Ltd.

Lime Kilns
Improved Equipment Co.

Locomotives
Buffalo Pitts Co.
Canadian Boving Co.
Montreal Locomotive Works
Canada Foundry Co.
F. H. Hopkins Co.
Mussens Limited.

Marble
Dominion Marble Co.
Missisquoi Marble Co.

Metal Lath
Greening Wire Co., B.
Metallic Roofing Co.
Noble, C. W.
Steel & Radiation Ltd.

Meters, Electrical
Ferranti Electrical Mfg. Co.
Can. General Eectric Co.

Meters, Water
Hopkins & Co., F. H.
McDougall Caledonian Iron Wks.
Neptune Meter Co.

Metal Forms
Hotchkiss Lock Metal Form Co.

Paints (Bridge and Structural Iron and Pipe Coating)
Canadian Mineral Rubber Co.
Dominion Paint Works.
Goheen Mfg. Co.
Ottawa Paint Co.

Paints and Varnishes
Dominion Paint Works.
Goheen Mfg. Co.
Pinchin, Johnson & Co.

Paving and Paving Materials
Dominion Creosoting Company.
Ontario Asphalt Block Co.
Paterson Mfg. Co., B.
Asphalt & Supply Co.
Barber Asphalt Paving Co.

Perforated Metals
Canada Wire & Iron Goods Co.
Greening Wire Co., B.

Pipe (Concrete, Iron and Wood)
American Spiral Pipe Works.
Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Pedlar People.
Piggott & Co., Thos.

Pile Driving Machinery
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.

Planing Mill Exhausters
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Plug Drillers
Canadian Ingersoll-Rand Co.

Plaster
Alabastine Company.
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

Plumbers' Supplies
Standard Ideal Company.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.

Portable Saws
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

Power Engines
Inglis Company, John.
Jenckes Machine Company.
Canada Foundry Company.
Waterous Engine Works.

Pumps and Pumping Machinery
Beatty & Sons, M.
Canada Foundry Co.
Canadian Boving Co.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Can. Supply & Contracting Co.
Cook, A. D.
Escher Wyss & Co.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Inglis & Co., John.
McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
Waterous Engine Works Co.
Mussens Limited.
Ontario Wind Eng. & Pump Co.
Wettlaufer Bros.

Quarry Machinery
Canadian Ingersoll-Rand Co.
Improved Equipment Co.
Lecky & Collis.
George Anderson & Co.

Railway Supplies
Canada Foundry Co.
Gartshore, John J.
Hopkins & Co., F. H.
Lecky & Collis.
Mussens Limited.

Refrigeration Machinery
Linde British Refrigeration Co.

Reinforcements, Concrete & Steel
Canada Steel Co., Ltd.
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.
Steel & Radiation Ltd.
Trussed Concrete Steel Co.
Turner, C. A. P.

Revolving Stone Screens
Greening Wire Co., B.

Road Asphalt
Canadian Mineral Rubber Co.
Barber Asphalt Paving Co.
Asphalt & Supply Co.

Road Machinery
Dore & Fils.
Erie Machine Shops.
Lecky & Collis.
Morrison & Co., T. A.
Mussens Limited.
Waterous Engine Works Co.
Western Wheeled Scraper Co.

Road Plows
Shurk Plow Company.

Roofing Material
Asbestos Mfg. Company.
Barber Asphalt Paving Co.
Can. Supply & Contracting Co.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

Ferranti Meters

Glass Case—Top Connections

Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
Top or bottom connections.
Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

WESTERN DUMP CARS

can be dumped and righted by fewer men and in less time than required for the same operation on many other cars

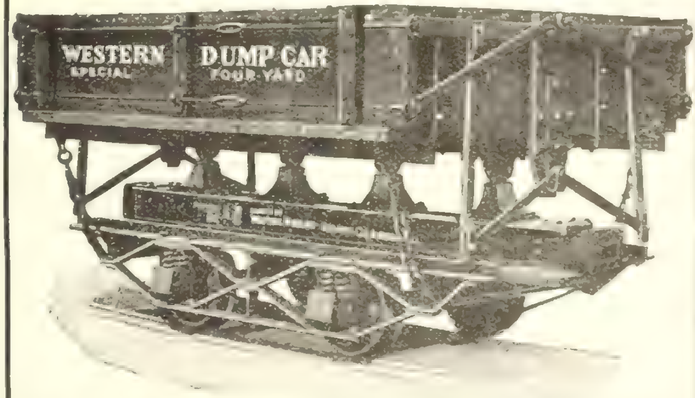
Prominent Contractors have made the above statement time and time again, and its a proven fact. Just think of the saving.

Western Air Dump Cars are used by many of the largest Railroads and at the Panama Canal.

There must be many reasons.

Let us tell you them.

WESTERN WHEELED SCRAPER CO.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia



Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Limited
Hagersville, Ont.

CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

Rubber Belting
[illegible] Tire & Rubber Co
Canadian Fairbanks-Morse Co.

Safes and Vaults
Taylor, J. & J.

Sand and Gravel
[illegible]
Sand and Supplies Limited
York Sand and Gravel Co
Alfred Rogers Limited.

Screens
Canada Wire & Iron Goods Co
Greening Wire Mfg. Co., B.

Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Sewer Pipe
[illegible] & Company
Canada Iron Corporation.
Dominion Sewer Pipe Co.
Gartshore Thomson Pipe Co.
Joy & Son.
National Iron Works.
Ontario Lime Co., Ltd.
Ontario Sewer Pipe Co.
Smyth & Ryan.
Standard Clay Products Ltd.
Nova Scotia Clay Works Ltd.

Sewer Trenching
Lecky & Collis
Austin Mfg. Co.
Municipal Engineering.

Sound Deadening
Cabot Inc., Samuel.

Shovels (Steam)
Browning Engineering Co.
Beatty & Sons, M.
Canada Foundry Co., F. H.
Hopkins & Co., F. H.
Montreal Locomotive Works.
[illegible]s Limited.
[illegible] Automatic Shovel Co.

Shovels
[illegible] Shovel & Tool Co.

Smoke Stacks
Des Moines Bridge Co.
Hamilton Mfg. Co., Wm.

Stains, Shingle, Cement & Brick
Cabot, Inc., Samuel.
Pinchin, Johnson & Co.

Steam Apparatus
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Steam Turbines
McDougall Caledonian Iron Wks.

Steel
Canada Steel Co., Ltd.
Dominion Steel Castings Co.
Lecky & Collis.
Provincial Steel Co.

Steel Bars
Canada Steel Co., Ltd.
Steel Co. of Canada.
Steel & Radiation, Ltd.

Steel Ranges
McClary's.

Stone
Britnell & Company.
Brodie, James.
Consolidated Stone Company.
Contractors' Supply Company.
Corinthian Stone Company.
Crushed Stone, Limited.
Hagersville Contracting Co.
Mahan & Company.
McMillan & Son, W.
Morrison & Co., T. A.
Myers Oakley.
Ontario Lime Co., Ltd.
Queenstown Quarry Co.
Roman Stone Company.
Rogers Supply Company.
Sackville Freestone Company.
Sand & Supplies.
Smyth & Ryan.

Stone Saws
Anderson, Geo.

Structural Iron and Steel
Canada Steel Company.
DesMoines Bridge Company.
Dominion Bridge Company.
Dominion Steel Castings Co.
Hamilton Bridge Works Co.
Mackinnon Holmes & Co.
McNeil & Co., W. P.
McGregor & McIntyre.
Phoenix Bridge & Iron Works.
Provincial Steel Company.
Reid & Brown.
Sarnia Bridge Company.
Steel Company of Canada.
Structural Steel Company.
Standard Steel Construction Co.
Walsh Plate and Structural Wks.

Submarine Drills
Canadian Mineral Rubber Co.
Lecky & Collis.

Swinging Gears
Dake Engine Company.

Tanks and Stand Pipes
Chicago Bridge & Iron Works.
Des Moines Bridge Company.
Hamilton Mfg. Co., Wm.
Inglis, John.
Jenckes Machine Co.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Ontario Wind Eng. & Pump Co.
Piggott & Co., Thos.
Walsh Plate and Structural Wks.
Waterous Engine Works Co.

Testing and Inspecting Bureau
Hunt & Co., Robt. W.

Valves
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Company.
Canada Foundry Company.

Ventilating & Heating Apparatus
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Company.

Vacuum Cleaners
Tuec Company.

Varnishes—Insulating
Standard Underground Cable Co. of Canada, Limited.

Wall Board
Bird & Son, F. W.

Waterproofing
Cabot Inc., Samuel.
Can. H. M. Johns-Manville Co.
Ceresit Waterproofing Co.
Pinchin, Johnson & Company.
Wadsworth Howland Co.

Water Softeners and Filters
American Water Softener Co.

Water Turbines
Canadian Boving Co.
Escher Wyss & Co.
Hamilton Mfg. Co., Wm.
McDougall Caledonian Iron Wks.

Wires and Cables
Canada Wire & Cable Co.
Imperial Wire & Cable Co.
Standard Underground Cable Co. of Canada, Limited.

Wire Guards and Screens
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.

Wire Rope
Canada Wire & Cable Co.
Greening Wire Co., B.
Steel Company of Canada.

Wood Turnings
Lyster Wood Box Turning Enamelling Co.

The Maple Leaf Elevators, Port Colborne. J. H. Tromanhauser, General Contractor.
80,000 sq. ft. Barrett Specification Roofing on this building.

This building is but one of the many large contracts executed by us.
Our years of experience and large equipment are such as to enable us to handle these large contracts with promptness.
We can include for any specification along the lines of a Built-up Roof, Damp-proofing foundations, sub-floors, etc.
Kalameined and Tin Clad Fire Doors, Skylights, Cornice and all Sheet Metal Work.
Send along your plans and specifications at our expense, we will quote you a close price and return them promptly.

REGGIN AND SPENCE

Roofing and Sheet Metal Contractors

530 Front Street West - Toronto

Tarvia

Preserves Roads
Prevents Dust~

Prince Street, Truro, N.S. Constructed with "Tarvia X"—1910.
Truro has continued to use Tarvia every year since 1910 and will pave a large area with Tarvia Macadam in 1913.

The Modern Road Binder

Plain macadam roads are adapted to slow horse-drawn traffic. Modern traffic, with its high speed, disintegrates and destroys the ordinary macadam. Its mineral binder cannot resist the thrusts of a driving wheel.

Roads adequate for modern traffic must be bonded with something adhesive, ductile and resisting. Such a binder is Tarvia, a specially prepared coal tar compound which retains its good qualities through all weathers and seasons and holds the stone firmly in place resisting all classes of modern traffic.

Tarvia is made in three grades:—"Tarvia X" is a very dense material to use as a binder in the large voids of new construction; "Tarvia A" is of thinner consistency for surfacing operations; "Tarvia B" is used cold, can be applied from a sprinkling cart and is sufficiently limpid to percolate into the pores of an old and well compacted road.

"Tarvia X" is required where new construction is called for. "Tarvia A" and "Tarvia B" are used in improving and protecting roads already in use.

A tarviated road or pavement is practically dustless and mudless and the maintenance cost is, in most cases, so reduced as to more than save the cost of Tarvia treatment.

Booklets on request.

THE PATERSON MANUFACTURING COMPANY, LIMITED
MONTREAL TORONTO WINNIPEG VANCOUVER
THE CARRITTE-PATERSON MANUFACTURING CO., LIMITED
ST. JOHN, N.B. HALIFAX, N.S. [illegible]

ALPHABETICAL LIST OF ADVERTISERS

[illegible]	107
[illegible]	36
[illegible]	23
American Enameled Brick & Tile Co.	110
American Hoist & Derrick Co.	2
[illegible] Works	25
[illegible] Company	
Anderson & Co., Limited, George	22
[illegible] Company	
[illegible] Company	11
[illegible]	99
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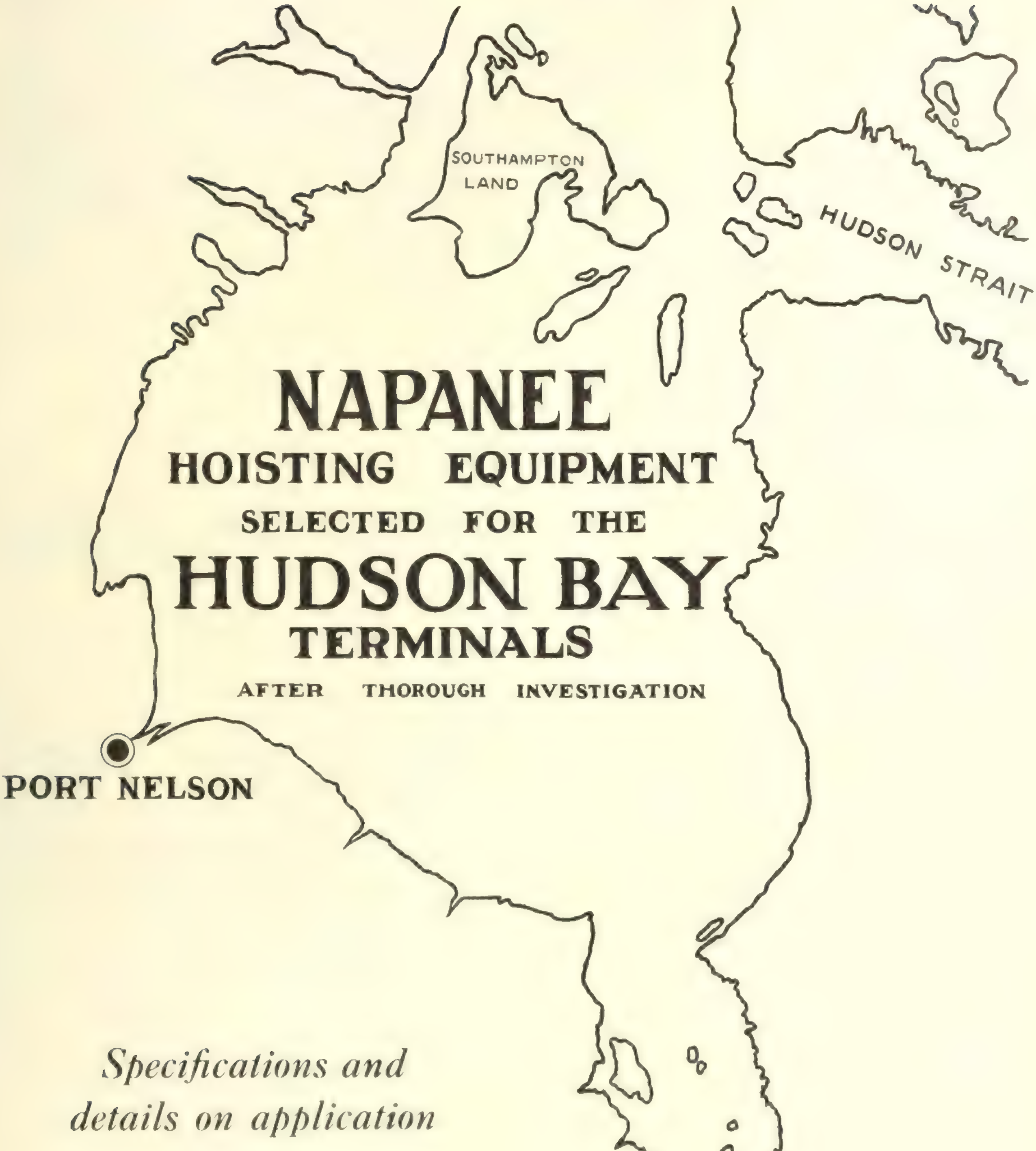

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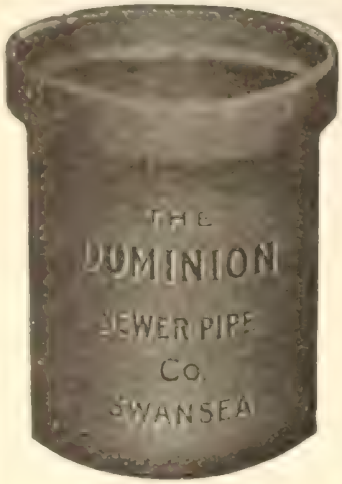

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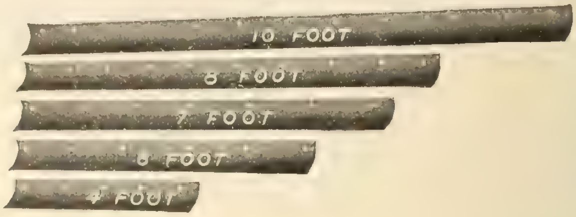

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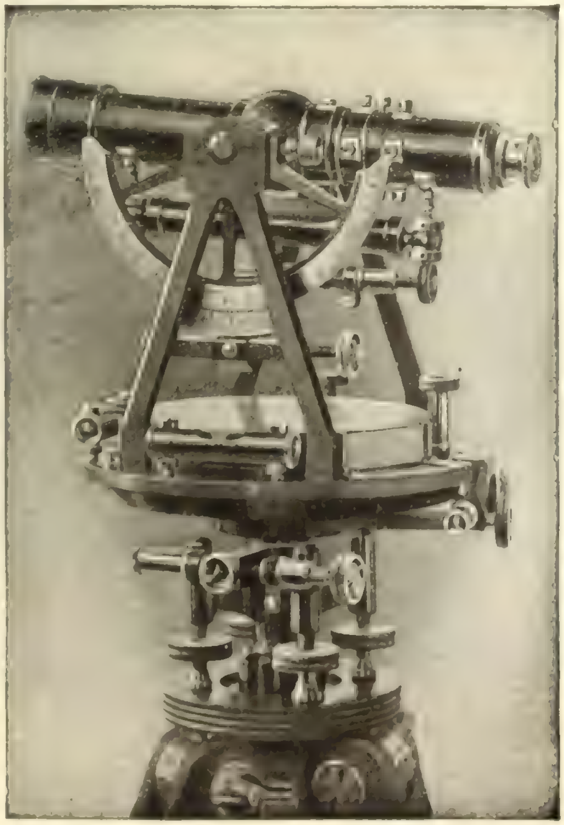

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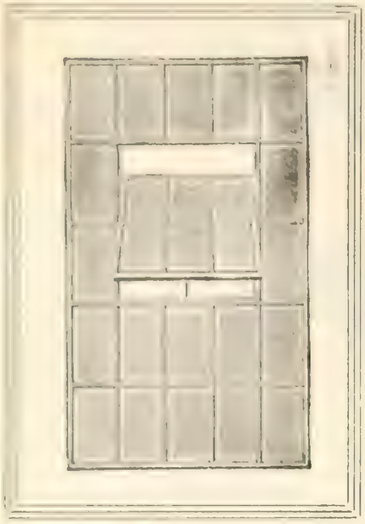

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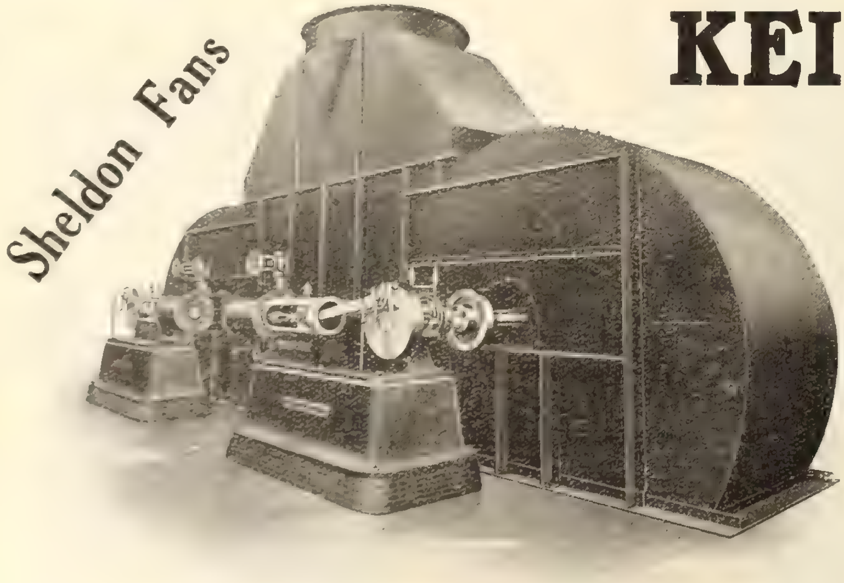

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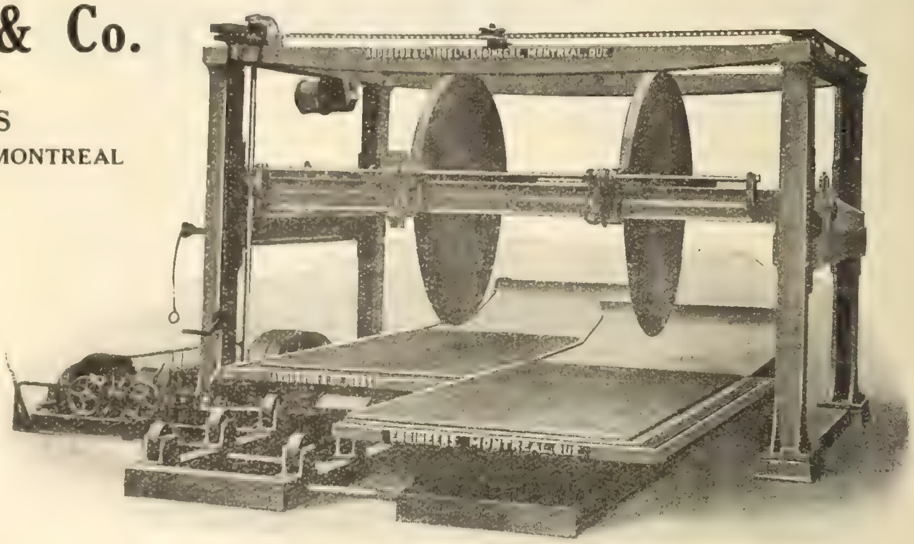

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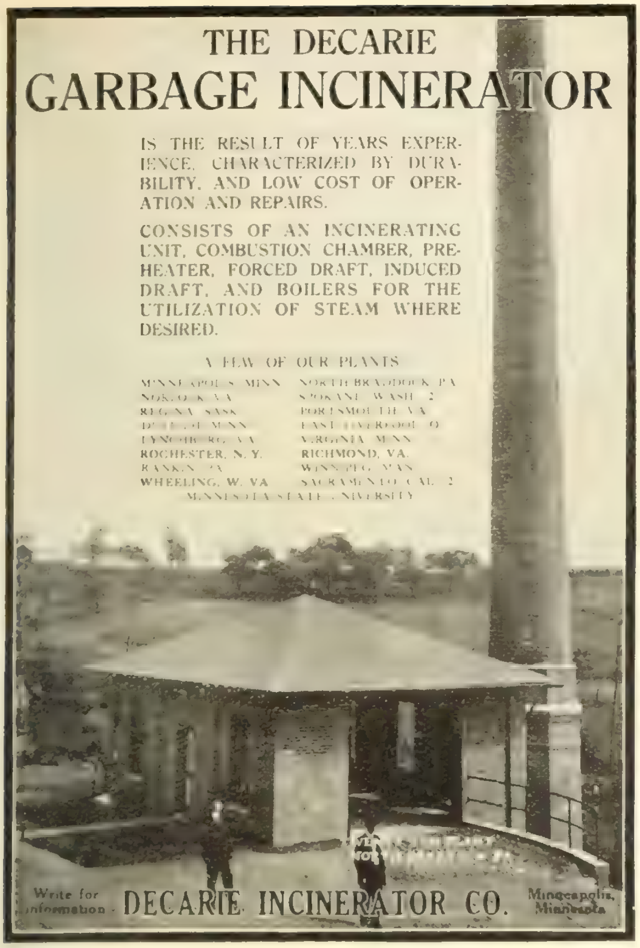

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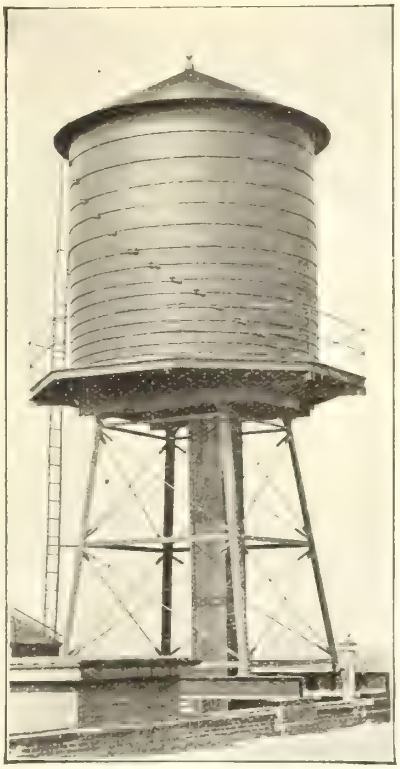

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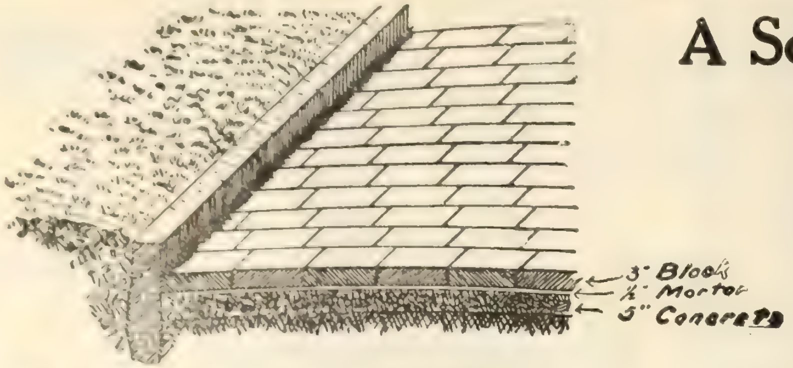

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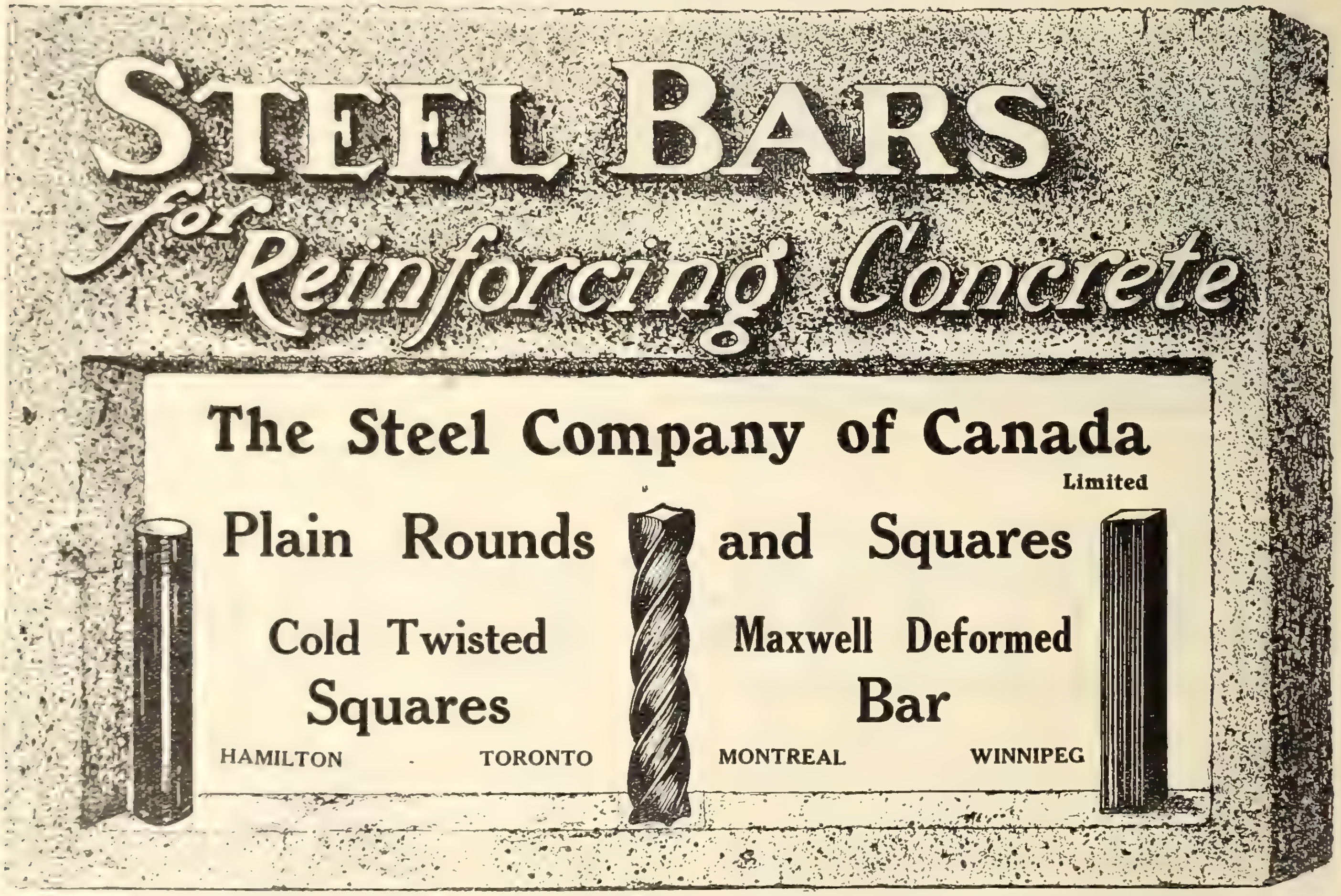

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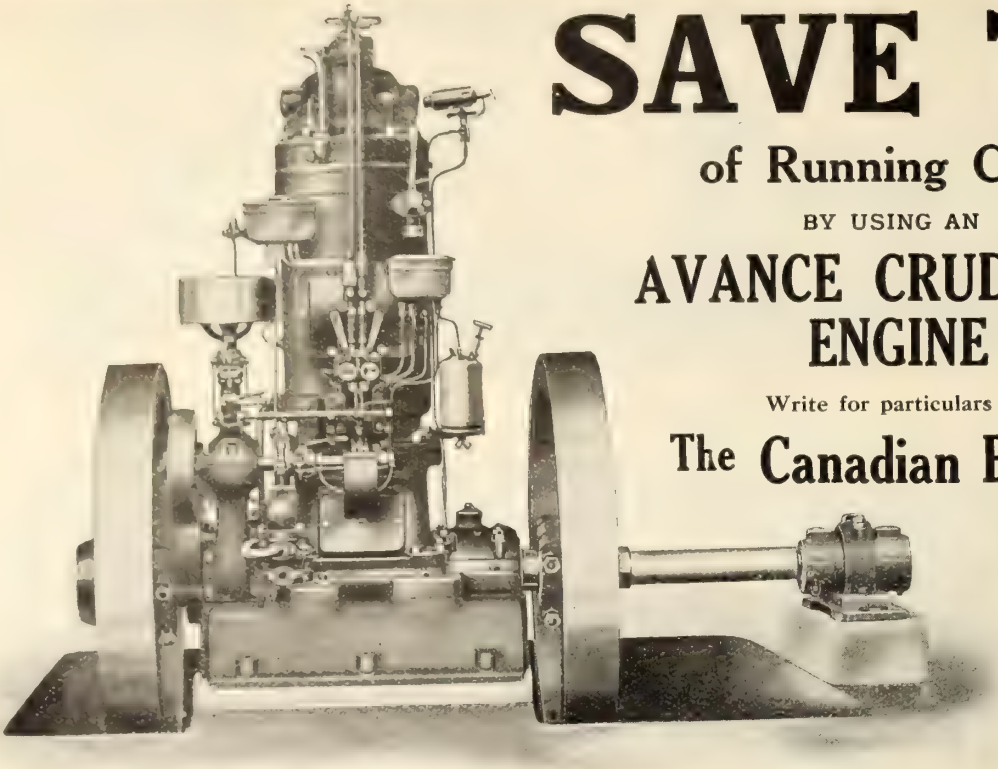

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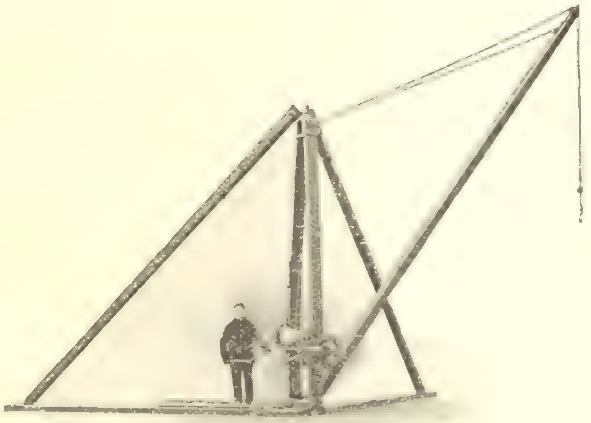

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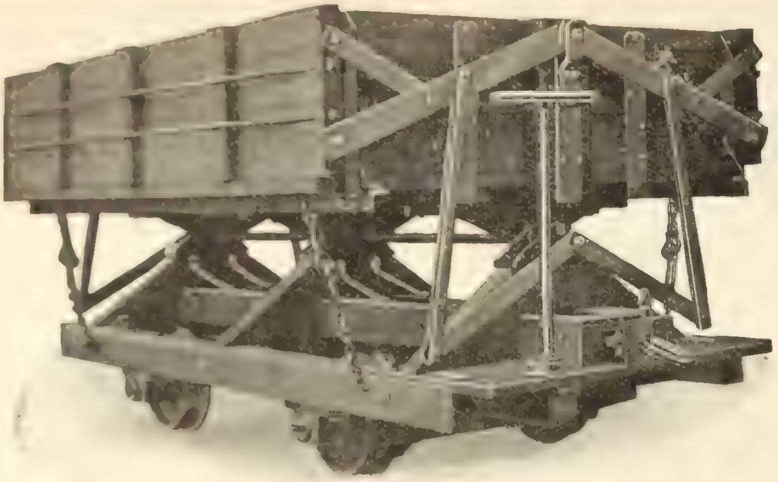

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Our product consists of Wood and Steel Frame Side and End Dump Cars, End Dump Grasshopper Rock Cars, Wheel and Axle Setts Boxings etc.

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have the strongest box and frame construction of any cars on the market. Note the double bracing of angle irons at corners of box. Under framing of box is especially designed to reduce working strains. Box is immediately removable from frame for transportation. They are shipped knocked down and load many more to a carload. All iron work and parts interchangeable on any car. Excellent door action.

MANUFACTURED EXCLUSIVELY BY

The Schell Foundry & Machine Company, Limited

Write for prices. Alexandria - - Ontario ***Send for photographs.***

Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT

The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

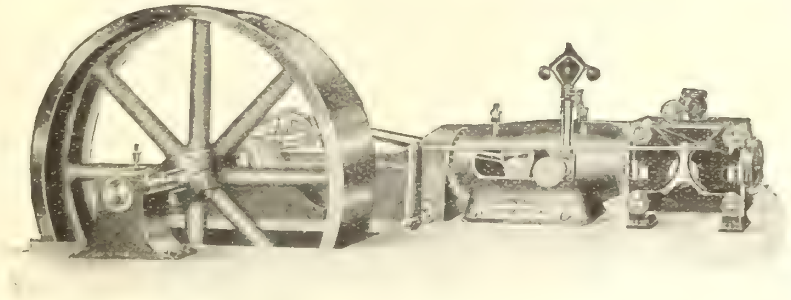
THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

It will pay you to investigate this shovel. Write for our catalog, C. R. It will explain the numerous features which make the Thew the most practical and economical machine of its kind on the market and will give you valuable information regarding cost of excavating.

The Thew Automatic Shovel Company, Lorain, Ohio

CORLISS ENGINES



THE value of Experience in the manufacture of "Inglis" Engines is emphasized by the ever increasing demand for our product.

Write us for particulars

The John Inglis Company, Ltd., **14 Strachan Avenue, Toronto, Canada**

ENGINEERS AND BOILER MAKERS

INDUSTRIAL LOCOMOTIVES

The day has come when only the very best locomotive will meet the needs of contractors, quarries and switching around mines and industrial plants. It is now necessary to produce special designs to meet special needs. For years we have been busy studying the conditions in all fields where locomotives are used and have designed our locomotives to meet those conditions.

Proper designs insure efficiency, reduce the coal bills lessen repairs and give maximum work for a minimum of expense.

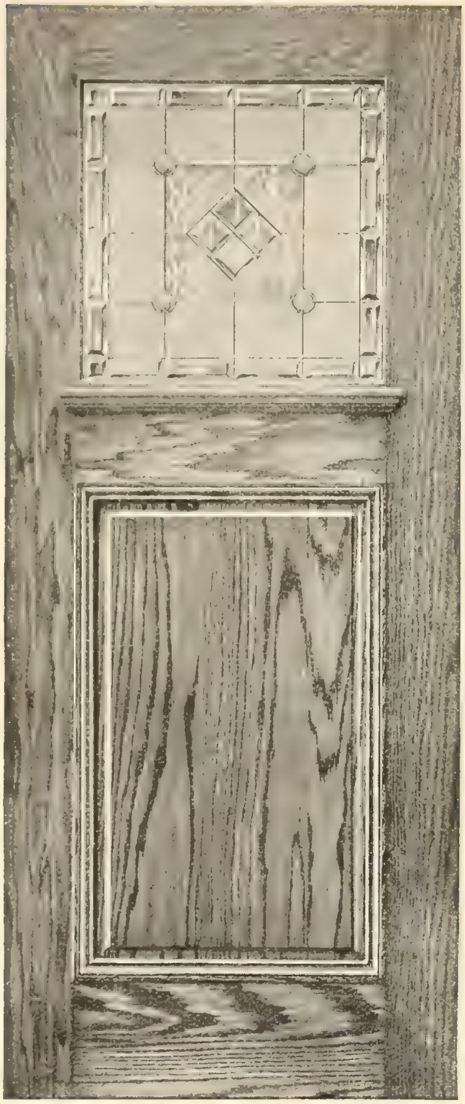
Our locomotives embody the best construction and are sturdily built. They are simple in design, and all wearing parts are accessible for easy repairs.

Interchangeable repair parts, sure to fit, are kept in stock for prompt shipment.

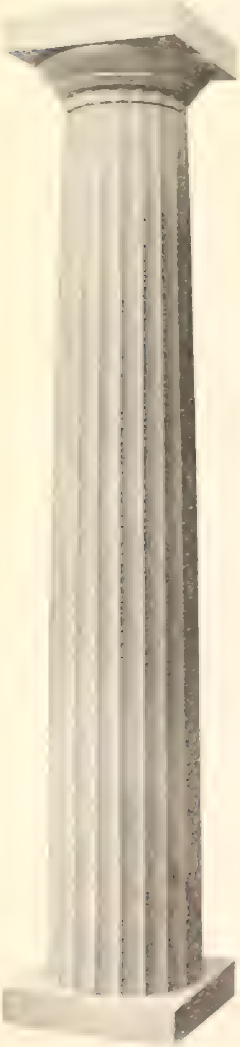
MONTREAL LOCOMOTIVE WORKS, LTD.

DOMINION EXPRESS BUILDING, MONTREAL, CANADA

Doors
Base
Balusters
Columns



Sash
Trim
Turnings
Newels

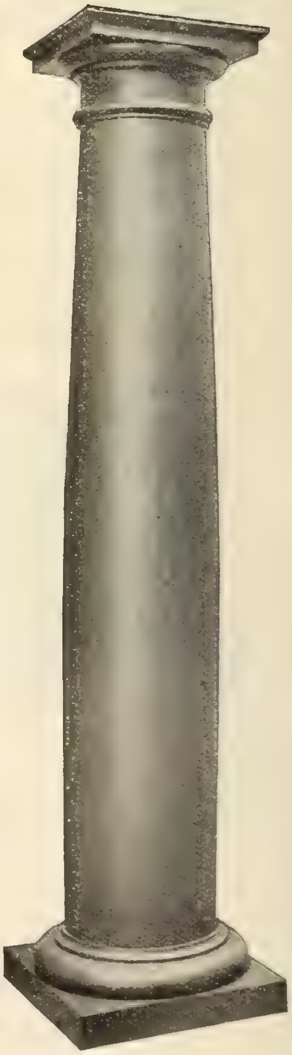


IF you want high-class doors of good appearance and made of selected woods, we suggest Batts Limited as the place to get them. The workmanship in our doors is thorough and all woods are properly seasoned giving the doors long life.

In our columns the special "V" lock joint makes it impossible for them to crack or open.

Specify "Batts" doors, columns and trim.

Batts
Limited
Pacific Ave., Toronto

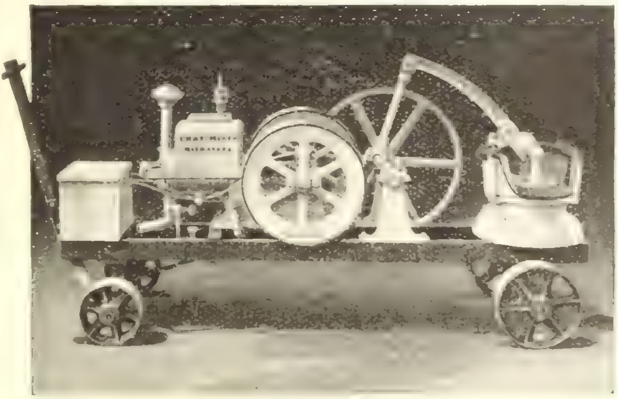


Power Driven Bilge Pump

This Portable Power Driven Diaphragm Bilge Trench Pump mounted on channel iron truck or wood skid is a complete Power Driven outfit for use of builders in pumping water from footings, trenches, cellars, coffer-dams, or on public works, where it is necessary to raise large quantities of water. The engine is a strong 3 H.P. water hopper cooled and the entire equipment is of up-to-date design, strong and simple in construction.

This Pump is made in two sizes, No. 3 Pump with 3″ side suction, pump capacity 3,000 gallons per hour and No. 4 Pump with 4″ side suction, pump capacity 6,000 gallons per hour.

Never sleeps and always on the job.



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Canadian Equipment & Supply Co., Calgary and Edmonton

Dominion Equipment & Supply Co., Winnipeg and Vancouver

Manufactured by

C. H. & E. Manufacturing Co. Inc.

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Partitions are easily made—
and attractively made with

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WALL BOARD
FOR WALLS AND CEILINGS

This is intended primarily for walls and ceilings in place of laths and plaster

Neponset Wall Board is **Waterproofed** and **Finished** in three attractive styles—cream white, burnt leather and plain oak.

Write for samples to

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(F. W. Bird & Son)

Main office: 16 Heinzman Bldg., Hamilton, Ontario
Mills: Hamilton, Ont., and Pont Rouge, Que.
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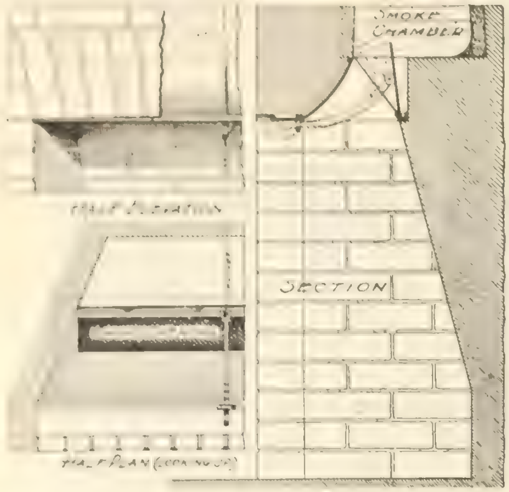
Covert Improved Fireplace Damper

PATENTED



- Forms Lintel to Support Brickwork.
- Presents Smooth Surfaces to Lead Smoke to Flue.
- Simplifies Mason's Work and Saves His Time.
- Provides Valve to Regulate Draft and Ventilation.
- Simply and Strongly Constructed.
- Cannot Get Out of Order.
- No Complicated Regulating Gear nor Piercing of Brickwork for Operating same.

Write for "Hints on Fireplace Construction"

Black Building Supply Company, Limited

MAIL BUILDING, - TORONTO

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TOCH BROS. **No. 232** **EST. 1848**

"R. I. W."

REMEMBER IT'S WATERPROOF

R. I. W.

DAMP RESISTING PAINT

MANUFACTURED IN CANADA

INSULATES
CHECKS DAMPNESS
BONDS PLASTER TO BRICKWORK
SAVES COST OF FURRING

Write for
Edition of "Red Book"

R. I. W. DAMP RESISTING PAINT CO., TORONTO

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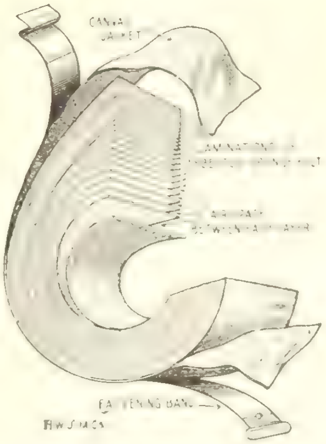
Won't Crack, Break, or Lose its Insulating Value from Vibration or Rough Usage



The temperature of high pressure pipes soon dries out moulded and ordinary pipe coverings. Then expansion and contraction of the pipes and vibration reduce the carbonate of lime (chalk) and other like materials, with which these coverings are filled, to a powder. This powder settles at the bottom of the canvas covering, leaving the top insufficiently covered, and gradually sifts through the canvas. Thus what little insulating properties they originally had are quickly lost.

J-M Asbesto-Sponge Felted Pipe Covering

retains its high insulating properties indefinitely. Pipes covered with it can even be walked on without injury. This is because it is made of many layers of fine paper, composed of pure long-fibre Asbestos and a small quantity of granulated sponge. It has been found in perfect condition after more than fifteen years' service on underground pipes.

Can be taken off pipes and replaced without injury.

ASK NEAREST BRANCH FOR SAMPLE AND BOOKLET.

THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED

Manufacturers of Asbestos and Magnesia Products ASBESTOS **Asbestos Roofings, Packings, Electrical Supplies, Etc.**

TORONTO MONTREAL WINNIPEG VANCOUVER

924

Large Stock of Wall and Beam Hangers

All Standard Sizes, and Quality the Very Best Obtainable

Made of Malleable Iron

8 Styles—42 Sizes

Send for stock sheet and prices.

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Head Offices: GUELPH, Ontario

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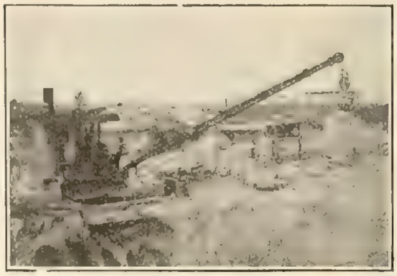

BROWNING

LOCOMOTIVE CRANES

saving their owners Time, Labor and Demurrage are illustrated in our latest Catalog. Write for one at once to

The Browning Engineering Co.

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Save the Time it Takes to Slack the Lime

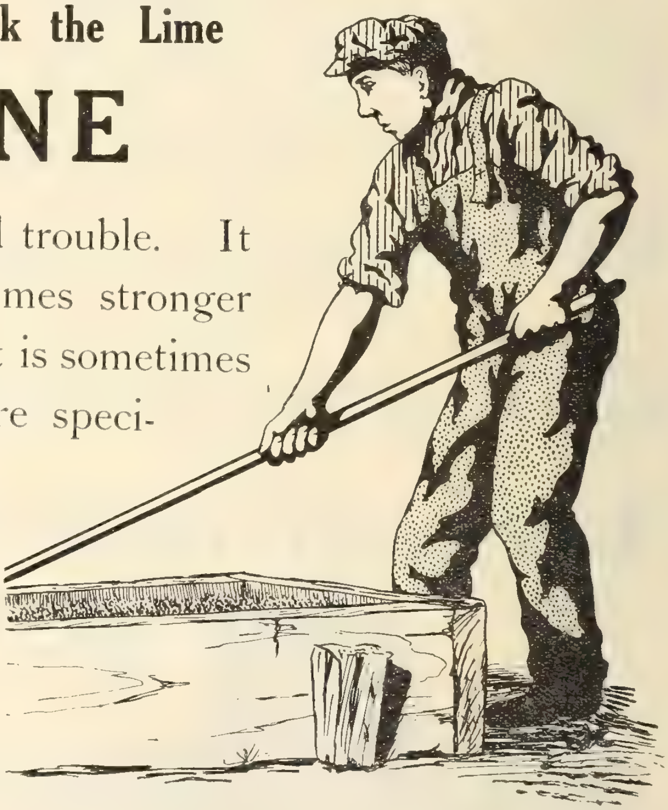
PARISTONE

Hard Wall Plaster saves time and trouble. It makes a permanent wall many times stronger than lime mortar. Your final cost is sometimes less, seldom more. Architects are specifing it for the most expensive buildings and contractors are using it on the smallest jobs.

If your dealer does not handle it, write

The Alabastine Co., Limited

Paris, Ontario



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SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

Canada Wire & Iron Goods Co.

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GAS PLANTS FOR INDUSTRIAL PURPOSES BLUE WATER GAS

LIME KILNS LIME BURNING PLANTS SPECIAL INDUSTRIAL FURNACES

"IECO" BRAND OF REFRACTORY FIRE CLAY MATERIALS

Western Lumberman

Representing the Lumbering and Woodworking interests of British Columbia Alberta Saskatchewan and Manitoba

Winnipeg, Man.

Let us Tender on Your Waterproofing and Roofing Specifications

We supply waterproofing and roofing materials of all kinds and undertake contracts for waterproofing and roofing, our complete equipment enables us to execute the work in accordance with Architects' and Engineers' specifications.

Foundations of C. P. R. Freight Terminals, Toronto

Our work on many notable Canadian buildings is a guarantee of our ability to successfully carry out the most important contracts.

The Waterproofing of the above foundation executed by:

Canadian Supply & Contracting Co., Limited

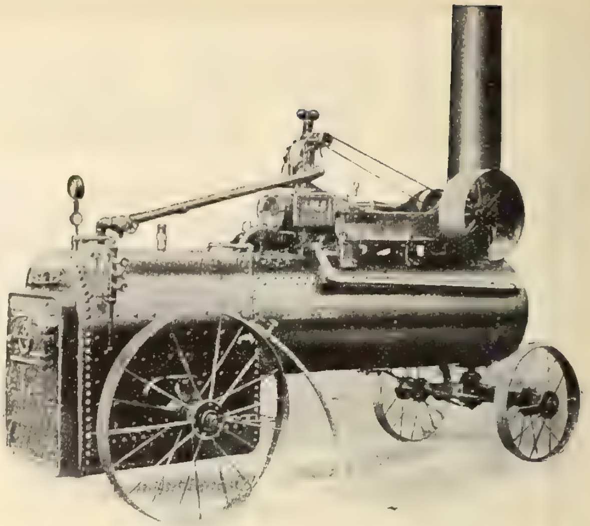
Structural Waterproofing Contractors and Waterproofing Materials

(Formerly Canadian Supply Co.)

Toronto

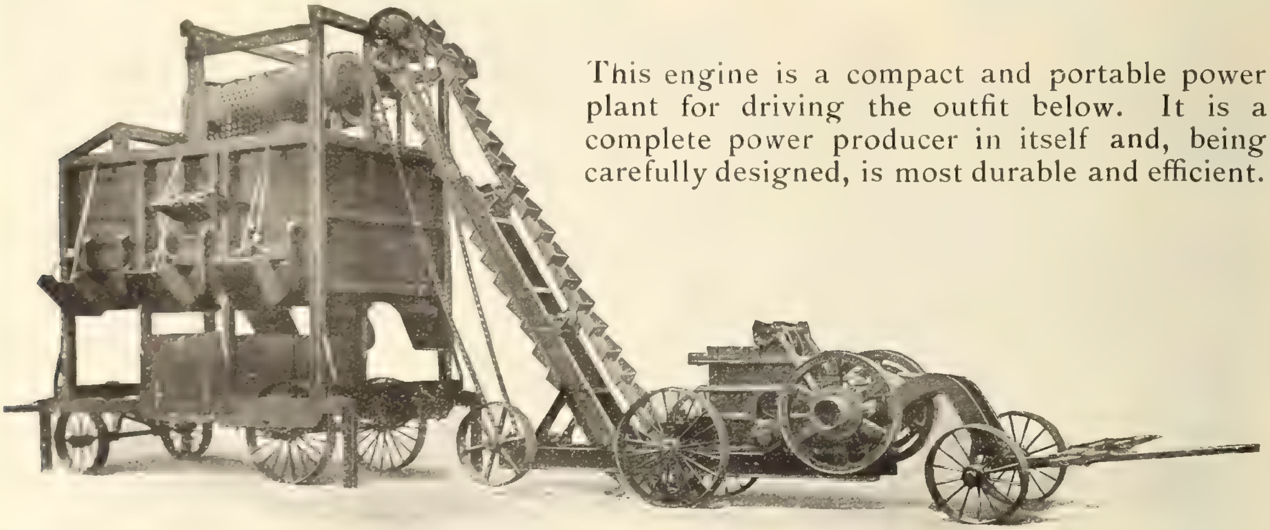
Good Roads
necessitate
Good Road Making Machinery

Expert knowledge cannot produce 100% good roads without high grade equipment. With Jenckes **Good** Road Machinery you obtain the result of our unequalled manufacturing facilities and our long experience in this class of work.



Locomotive-type Boiler and Engine

This engine is a compact and portable power plant for driving the outfit below. It is a complete power producer in itself and, being carefully designed, is most durable and efficient.



Portable Rock crushing, grading and loading plant

Consists of a Rock Crusher, Elevator, Screen and Storage Bins, all mounted on wheels for easy transportation and arranged to run as one unit when in operation. The Crusher is our All-Steel Construction, the frame being a solid steel casting, heavily ribbed, to give the required strength.

The Bin has usually three compartments, is strongly made and steel lined, with hinged discharge chutes arranged for loading carts from either side. It is mounted on wide-tire wheels and is arranged to receive on top the screen and elevator head.

Bulletins and further particulars can be had on request from any of our branch offices.
We manufacture a full line of Road Making Machinery.

THE JENCKES MACHINE CO LIMITED

SHERBROOKE MONTREAL ST. CATHARINES COBALT
SOUTH PORCUPINE NELSON VANCOUVER

40 years continuous service and the bearings still in good condition

Steel Pressure Blower, one type of

Sturtevant
(REG. U. S. PAT. OFF.)

Stock Fans

Read this letter from the Master Mechanic of the Georgia Railroad:—

"We have a No. 7 **Sturtevant** Fan, which we have had about 40 years. It has just given out; that is, the fan part has worn out; the shaft, bearings, etc., are all in good condition. All we want is the moveable part of the fan. Can you furnish it to us. Please advise us promptly. I have endeavored to find some date on it, but there appears to be nothing on it except the size, No. 7, and your advertisement in raised letters.

Why They Last

The best materials only are used in their construction. The wheels are carefully balanced, the shafts are made of the best quality steel, turned and ground to exact size, the bearings are large and lined with the highest grade anti-friction metal.

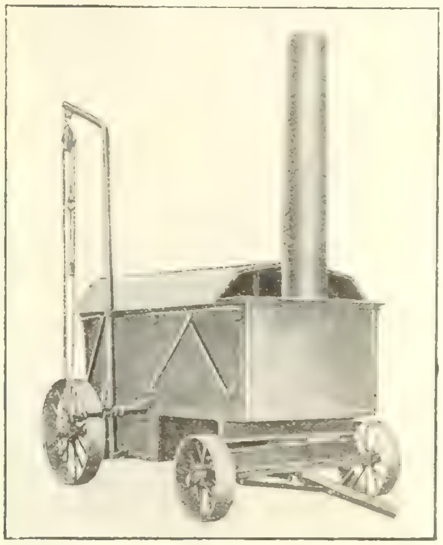
Sturtevant Stock Fans are built in all types and sizes, and are carried in stock ready for immediate shipment at our works, at Hyde Park, Mass., and at our Philadelphia, Chicago, and San Francisco warehouses.

Bulletin No. [illegible] describes them more in detail.

B. F. Sturtevant Company, of Canada, Limited

Montreal, P. Q.

Tank will heat to 400 degrees Heaviest Binder in any weather in less than one hour.



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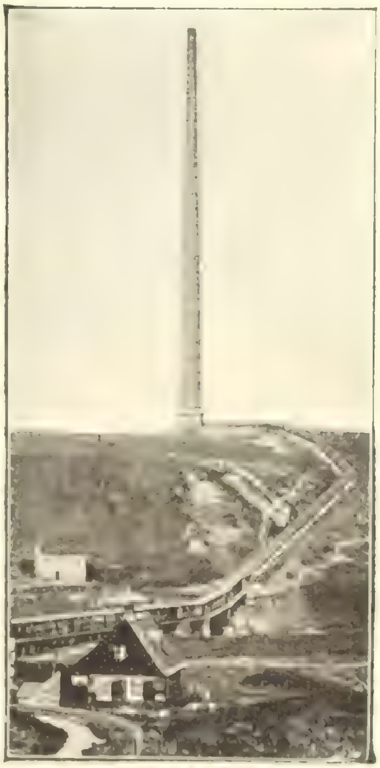
SHIPPED
SAME
DAY
AS
RECEIVED

MADE
TO LAST

MADE IN TWO SIZES

Stevenson & Leonard Machine Co.

Albany, N. Y.



460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

HEINICKE CHIMNEYS

will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a **HEINICKE.**

Write for catalogue

H. R. HEINICKE, INC. New York, U. S. A.

Representatives for Canada:
Black Building Supply Co. Ltd., Toronto

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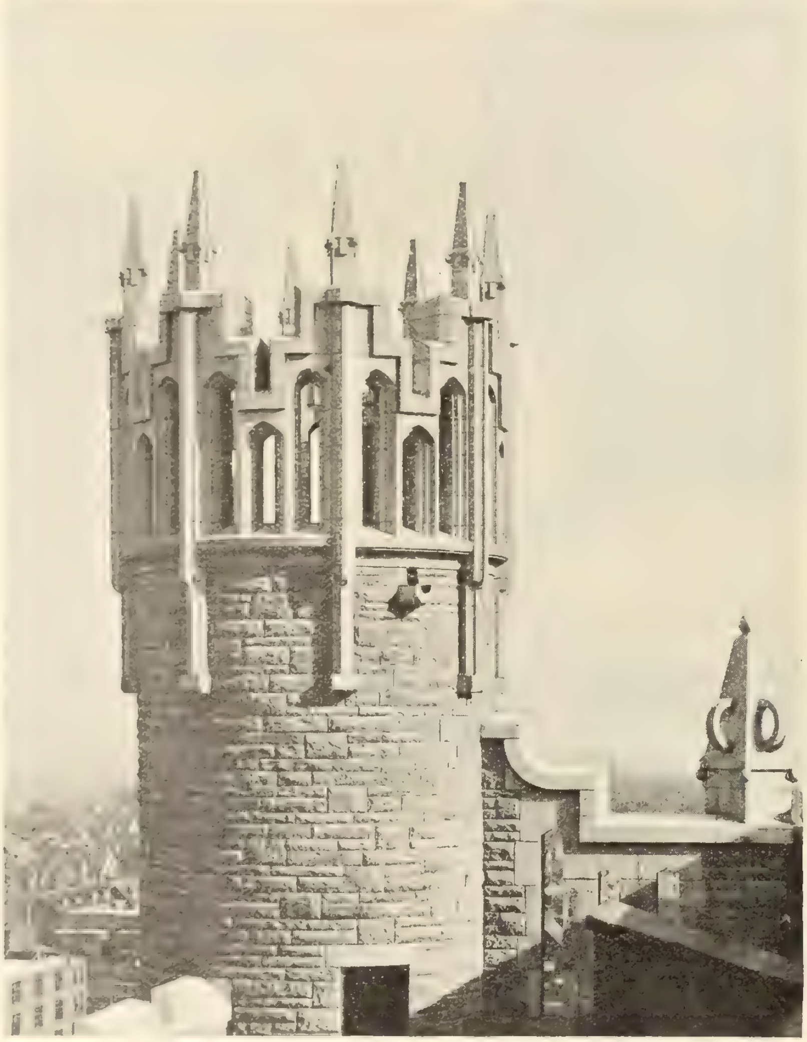
FOR PERMANENT EFFECTS



A Tower of Sir Henry Pellatt's Mansion

This is a good example of the detail work being done in Roman Stone. The best Architects can now see their most elaborate designs fully carried out in stone.

Our process lends itself to this class of work.

Specify Roman Stone and your work will be ***permanent.***

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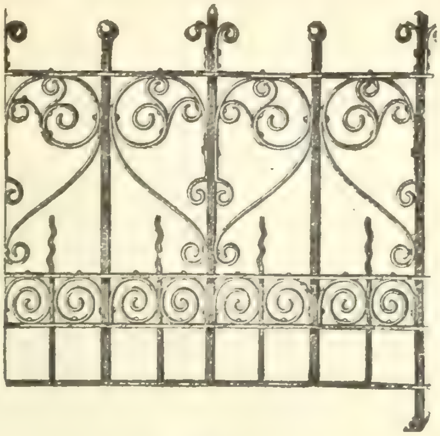
Drafting Room, Foundry and Stone Yard,
Weston, Ont.

T. A. Morrison & Co., 204 St. James St., Montreal
Sales Agents for Quebec



Iron Fences

EVERY conceivable style and design in ornamental iron fence work can be faithfully carried out by us.

Send in your specifications and get our quotation.

We also specialize in iron stair work.

The GEO. B. MEADOWS

Toronto Wire, Iron and Brass Works Co., Limited
Meadow's Block, Wellington St., W.
Toronto, Ont.

We Can Offer You the Results of Long Service Tests

as a guarantee of the durability and economy of our armored cable. The illustration shows the installing of 185,000 feet of

"STANDARD" Steel Tape Armored Cable

in the city of Mexico in 1901. This cable was examined recently by disinterested engineers and found in perfect condition after giving satisfactory service for 12 years.

"STANDARD" Steel Tape Armored Cable is installed directly in the ground in a shallow trench without conduits of any kind. We have hundreds of thousands of feet of our cable installed in this manner and giving economical service. *Write for our literature and prices before you buy.*

Standard Underground Cable Co., of Canada, Limited

Montreal, Que. **Hamilton, Ont.** Winnipeg, Man.
Boston, Mass. Seattle, Wash.

Asbestos Corrugated Sheathing

Protects Interiors from Extreme Heat

The high temperature which is [illegible] developed behind walls and roofs of corrugated iron, can be avoided by the use of Asbestos Corrugated Sheathing.

This Sheathing does not heat up like metal on the exposed surface, and the insulating properties of the Asbestos prevent the heat from working through to any extent and radiating into the building.

In the winter these same insulating properties greatly lessen the amount of heat which escapes through walls and roof.

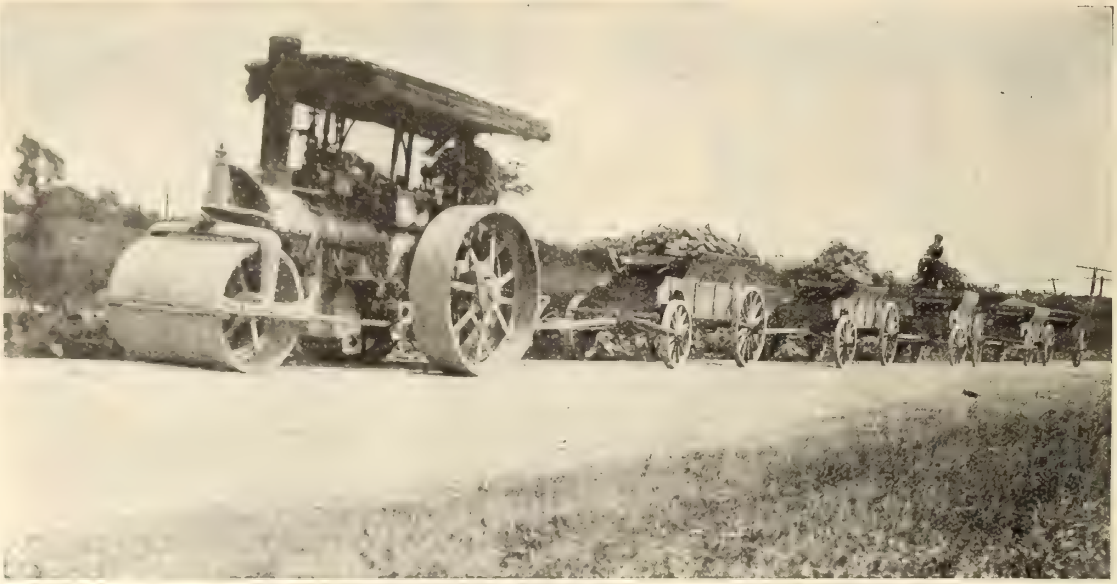
Whether the building is to be used to accommodate workmen or to store goods, this protection from extremes of temperature is most important.

Moreover, Asbestos, Corrugated Sheathing is absolutely fireproof, never requires painting, and is practically everlasting.

Write for Booklet 9, which gives particulars and prices.

Asbestos Manufacturing Co., Limited

Address E. T. Bank Bldg., 263 St. James St., Montreal. Factory at Lachine, P.Q. (near Montreal)



No Horses Used on This Job

Saving the Cost of Six Teams

Hauling road material—crushed stone, wooden blocks, tools, etc., in a wagon train such as this—doing the work of six teams and as many men—and at the same time compacting instead of tearing up the road over which the haul is made—is one way of building good roads, **cheaply,** with

The Waterous Steam Roller

Progressive Municipal road builders and contractors in Canada are cutting road making costs in half by using a Waterous Roller in **every** road building operation.

They use the Waterous Roller to haul their road materials. Where the haul is of any length this means a saving of from $30 to $50 per day on this one labor item alone. When the grader, road plow, or scarifier is employed, they hitch it to the Waterous Roller. It does the work better and cheaper than any other tractive power available. Every phase of the rolling—sub-grade, stone, and surface binder—is done with Waterous Roller. The road is ready for traffic as soon as rolling is finished. When outside work is at a standstill the stone crusher is set to work,—and the Waterous Roller drives it.

In every one of these operations the Roller can be used to give results that pile the profits on the right side of the ledger. It not only does this, but it is designed and built to be right on the job—and stay there—every working day in the year. Waterous Rollers sold nineteen years ago are still giving first class service.

Over 165 Canadian Users

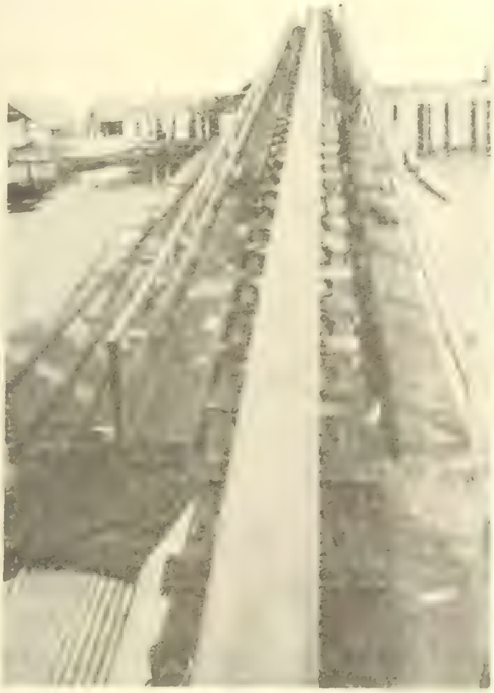
among them the largest municipalities and leading contractors in this country—are proving our statements this year. There is a Waterous Roller in your neighborhood. Let us tell you where—See it at work and judge for yourself.

The Waterous Engine Works Co., Limited

Brantford - Canada

Winnipeg, Man. **H. B. Gilmour, Vancouver, B.C.**
Hugh Cameron & Co., Manning Chambers, Toronto

Goodyear Conveyor Belt for the Rainy River Gravel Co., Vancouver. Made in one piece—seven hundred and fifty feet long.



Seven hundred and fifty feet Goodyear Conveyor Belt in actual service at Rainy River, Vancouver.

GOODYEAR

SPECIAL BELTS for Special Purposes

GOODYEAR IMPERIAL HIGH-SPEED BELTING

FOR high speed a High Speed Belt should be used. Great strength is demanded. A belt that is to grip a small pulley and transmit high power must be specially built for the purpose. It must resist the strong tendency to slip on the small, rapidly-revolving pulleys.

This Goodyear High-Speed Belt is made with a friction surface that grips the face of the pulley—conveying all the power.

It gives long service. The belt is durable because there is no internal friction—no ruinous grinding. That is where the Imperial High Speed Belt excells. It flies around a small, high-speed pulley without setting up internal friction.

In Goodyear Belts the elimination of all stretch, and the solid cohesion of duck and rubber, prevent any movement within the belt. Thus the belt gives long service and efficient service.

ELEVATOR BELTS

Elevator Belts are a Goodyear Specialty. The essential requirement in these belts is strength—and Goodyear Elevator Belts have it. That is why they are in constantly increasing demand. The buckets do not pull out. Long wear in the belt is assured because the plies of fabric do not separate in service. Goodyear Rubber Belts are used in hundreds of elevators throughout Canada.

CONVEYOR BELTS

Where a sound and reliable belt is needed for hard service—for the conveying of stone, grain, ore, coal, etc., a Goodyear Conveyor Belt specially made for the work is the best investment. The Goodyear Conveyor Belt has a rubber face of great toughness, which prevents cutting and chipping, and increases the life of the belt. Not affected by weather. We make Conveyor Belts to any specifications. No better conveyor service can be given than that obtained from a Goodyear Belt.

ENDLESS BELTS

We make Endless Belts to order in any width, length and thickness [illegible] for any purpose.

Part of an order of fifty [illegible] of Elevator Belting for the Saskatchewan Government Elevators.

[illegible]
you'll find it useful. It is free.

THE GOODYEAR TIRE & RUBBER CO.
of Canada, Limited

Head Office Factory
TORONTO Bowmanville

Branches: Victoria, Vancouver, Calgary, Edmonton,
Regina, Winnipeg, Toronto, London, Hamilton,
Montreal, St. John, N. B.

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We specialize on the following:

- Gray Silica Face Brick and Glazed Brick.
- Esco Steel Protective Paints.
- Ceresit Waterproofing Compounds.
- De Lavergne Artificial Ice Plants.
- Keystone Gypsum Blocks.
- Nelson Bronze Iron and Steel Valves.
- Terra Cotta and Faience.
- Feed Water Filters and Grease Extractors.
- Reliance Ball Bearing Door Hangers.
- Sturtevant Ventilating Sets and Blowers.
- Sky Lights and Metal Windows.
- Steel and Kalameined Doors.
- Custodis Radial Brick Chimneys.
- Taylor Gravity Underfeed Stokers.
- "Pen Dar" Metal Lockers.

Write us for quotations

Douglas - Milligan, Limited

Builders' Supplies and Engineering Specialties

304 University Street, **Montreal.** **Toronto,** Confederation Life Building.

Three Section Incinerator—Type No. 2

Sewage and Garbage Incinerators

In Standard Ideal Incinerators the accumulation of the matter—both solid and liquid—is absolutely sanitary and non-infectious. The system of Incineration is complete—the solid matter being reduced to a small ash and the liquids completely evaporated.

It is important to note that in the latter process the system of drafts is arranged so that the fumes and vapors arising from the accumulation must pass through the fire before reaching the open air. This obviates all obnoxious odours.

The United States Government finally selected this type for the disposal of toilet refuse in its military camps and elsewhere, after trying every other apparatus on the market.

Standard Ideal Incinerators are made in two types:

TYPE No. 1 is intended for the use of 10 persons daily.

TYPE No. 2 is sectional; one section alone having a capacity for 25 persons daily. The addition of extra sections increases their capacity proportionately.

Write for booklet
"INCINERATION AND INCINERATORS.

The Standard Ideal *Company Ltd.*

PORT HOPE, ONTARIO

Branches: WINNIPEG TORONTO MONTREAL VANCOUVER

ESTABLISHED 1886

Contract Record
and Engineering Review

PUBLISHED EACH WEDNESDAY BY
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Vol. 27 June 11, 1913 No. 24

Deposits With Tenders

THERE would appear to be considerable divergence of opinion as to the merits and demerits of the Canadian system of requiring a substantial deposit with tenders. This matter was brought to the fore recently in some of the English papers. The general trend of the discussion was that while it might be reasonable to ask for a small deposit on the issue of specifications and copies of drawings, so as to discourage the demand for particulars except from firms intending to submit bona fide tenders, there was no justification for demanding substantial deposits when such tenders were lodged. With a view to ascertaining the feeling of the contracting interests in Canada we submitted an enquiry to some of the leading firms. The replies are interesting if from no other standpoint than from the divergence of the views expressed. A somewhat extended enquiry on the part of the Contract Record discloses the fact that generally there is no objection to a requirement of five per cent. of the amount of the tender. It is not difficult, however, to find cases of disagreement even on this score, as will be seen from the letters published in another column.

For our own part we incline strongly to the opinion that the deposits required with tenders for Canadian work are unnecessarily large. In many cases the work is of such a nature that only three or four established concerns can put in a tender. In such a case, where there can be no doubt as to the bona fide intentions of the bidders, there appears to be no justification for demanding substantial deposits. The estimates for the larger undertakings in the contracting field are made at a considerable outlay, and under ordinary circumstances the firms preparing these tenders are not likely to refuse work over which they have spent so much time and money.

We are in accord with one of our correspondents who condemns the Dominion Government requiring a certified cheque for 10 per cent. of the amount of the tender and retaining the money until the completion of the work.

We believe that this is a field which should be covered completely and legitimately by the various guarantee companies. Excessive deposits tie up the contractor's funds and put an added and unnecessary burden upon him, thus militating against the best interests of the work. The arguments pro and con lead us to conclude that the system of deposits obtaining in the Canadian field is one which requires thoroughly overhauling. The Dominion Government might well take the initiative.

American Record Broken on Montreal Contract

Among important railway undertakings now in progress throughout Canada no individual contract commands such universal interest as the C. N. R. tunnel through Mount Royal, the construction of which is the subject of an interesting article contributed to this issue by Mr. J. L. Busfield. The details given by Mr. Busfield convey an excellent idea of the work, but the magnitude of the undertaking will perhaps be better appreciated when it is known that the work involves the expenditure of something like twenty million dollars. This sum includes real estate, the construction of the tunnel, passenger and freight terminals, and also a modern hotel, which will be built adjacent to the station. In connection with this work it is of interest to mention that the record of the American continent for a heading in hard rock was broken on June 5th. No. 1 west heading of the Mount Royal tunnel, 8 feet by 12 feet, in very hard limestone, cut by harder dike of igneous rock, was driven 810 feet in thirty working days. The previous record was made at the Arizona Copper Mines, where a heading, 8 feet by 8 feet, was driven 799 feet in thirty working days. The new record established upon the Canadian undertaking speaks well for the modern equipment and efficient organization of the working forces.

The effect of electrolysis on the steel reinforcing rods employed in concrete construction was demonstrated by the United States Bureau of Standards in its exhibit at a recent Cement Show in Chicago. It was shown that local currents are set up in the material, owing to moisture and impurities which produce iron oxide. Since this compound occupies a larger volume than the original material, a pressure is exerted that eventually results in cracking the concrete. To determine the amount of this pressure a steel cylinder having an internal diameter of 1½ inches was fitted with a steel rod 1-in. in diameter and the space between filled with cement. This was then immersed in water and the core connected to an electric circuit. By measuring the expansion of the outer cylinder it was found that the oxidation of the core produced a maximum pressure of 4,700 lb. per square inch. A column of concrete 1 ft. long and 6 in. in diameter with its metal core was immersed in water and subjected to 50 volts with the core as the anode, and in three hours the specimen was cracked.

On June 21, the Vancouver chapter, B. C. Society of Architects will open their First Annual Architectural Exhibition at the quarters of the Progress Club,

Deposits With Tenders.—To What Extent are They Justified?

IN the letters from a number of prominent contracting concerns reproduced herewith there will be found many interesting observations bearing upon the subject of deposits with tenders. An editorial reference is made elsewhere in this issue, but for an intelligent reading of the appended letters it may be necessary to explain that the replies were in answer to an investigation by the Contract Record, in which we asked an expression of opinion regarding the following points:

(a) Are contracting interests affected adversely by a requirement of, say, 5 per cent. of the amount of the tender?

(b) Is such a requirement necessary in the interest of the authorities?

(c) What alternative would you suggest?

Our letter concluded with the following paragraph:

"A comparison of the contract advertisements in the Contract Record and in the English papers is illuminating as to the difference between Canadian and British practice. In England, apparently, the requirement of a deposit of £5 upon the largest work is about the maximum. It seems to us that a great deal of money is tied up unnecessarily in the contracting field here and if we can obtain sufficient confirmation of our views we shall be pleased to inaugurate a discussion in our editorial columns."

The replies received are illuminating in many particulars and we believe that the discussion can be carried on advantageously to the Canadian contracting interests.

Government Practice Criticized

Editor Contract Record,

We beg to reply to your recent inquiry as follows:—

Question (a)—No.

Question (b)—Yes, if the parties calling for tenders are Government or Municipal bodies.

Question (c)—The Bid Bond of a bonding company would answer the same purpose.

We do not approve of submitting deposit cheques to private individuals, since the contractor is taking just as much risk as, if not more than, the party who is financing the work. We also think that deposit cheques should be released when a suitable contract bond is furnished. As doubtless you know, the Dominion Government calls for a certified cheque for ten per cent of the tender. We think that this should be reduced to five per cent and the cheque returned when bond is furnished. They cash the 10 per cent. now and retain it until the work is completed.

Yours truly,

Wilson, Townsend & Saunders.

Guarantee Bonds the Solution

Editor Contract Record,

We do not consider that any deposit is necessary for a tender on private work where the owner has the right to accept any tender that he wishes or reject them all; but in public or municipal work, where city engineers or committees handle the work and have to decide on the tender to be accepted, it is much better for them that tenders be accompanied by a deposit sufficient to keep out contractors who are irresponsible and incapable of carrying on the work.

If a city, municipality or government is calling for tenders which should be opened in public, the parties deciding upon the tenders are placing themselves in a doubtful position if they reject one tender and accept another from a contracting firm who, in their opinion, are more capable of carrying out the work to the best advantage. No matter how unreliable a contractor is he usually has some friends who will make trouble if his tender is turned down, and who will endeavor to prove that he could have carried out the work and that the Committee was spending the peoples' money unnecessarily by accepting the tender of a higher and more responsible contractor. Where it is private work and a man is spending his own money, a deposit with a tender is not required, as the owner can look over the tenders received and select the one that it most satisfactory to him, and it is no one's business but his own what he pays for his work.

There seems to be a desire on the part of Governments and other public bodies to ask for a marked cheque to accompany the tender, and at the same time hold this marked cheque as a bond for the faithful performance of the contract. This is unnecessary and some firms have refused to tender under these conditions.

We find, on inquiry, that in most of the cities of the United States the bond companies are willing to supply reliable contracting firms with tender bonds, that is, bonds which guarantee the signing of contract if their tender is accepted. Usually these bonds are changed after the tender is accepted and serve as a guarantee bond for the faithful performance of the terms of the contract. There is no reason why this arrangement could not be made in the cities of Canada. The bond companies would prepare to do this if it became the universal procedure of the public bodies calling for tenders. Some time ago the Builders' Exchange at Winnipeg took up the matter with the city of Winnipeg and they are prepared to do this on any of their work on which they are calling for tenders. This gives the party calling for tenders all the protection required and does not work a hardship on the contractor if he is responsible, because the charges for these bonds are not very much and the amount is usually added to the estimate for the work; but it is a hardship on contracting firms to put up marked cheques with tenders, and it is more of a hardship to have these cheques remain in the hands of the owners until the work is completed. A firm may get these marked cheques at a low rate of interest at the bank, but it is always deducted from his credit, and gives him just that much less money to use in carrying out the work. There are very few firms in Canada who do not need all the money at their command to carry on their undertakings.

So that if the large corporations and owners will adopt a scheme of tender bonds, and guarantee bonds after the tender is accepted, it will be more satisfactory to contractors, and at the same time eliminate contractors who are not able to give bonds on work of any size.

Very truly yours,

Carter-Halls-Aldinger Company, Limited.

Deposit Cheques from Insurance Companies

Editor Contract Record,

There are instances where such deposits may be reasonably required, but in most cases the difficulty is that an actual cheque is required, which ties up money. This could be obviated by allowing deposit cheques from insurance companies. Any reliable firm can secure such a deposit cheque for a small fee and there is no hardship incurred.

Yours faithfully,
D. G. Loomis & Sons.

Five Per Cent. Not Excessive

Editor Contract Record,

We think that the 5 per cent. deposit with a tender is fair. It keeps irresponsible parties from bidding on work, especially on smaller contracts. The successful contractor, upon giving a proper guarantee or bond, should have his tender cheque returned. This is the general rule followed for all civic school boards and Government work, and our only objection is in being asked to deposit a marked cheque for ten per cent. of our bid, which, in our opinion is excessive.

Yours very truly,
McGregor & McIntyre, Limited.

English Practice Commended

Editor Contract Record,

We consider that it is most unfair on behalf of municipalities, private corporations, etc., to demand with each tender put up a certified cheque of 5 per cent. of the amount. In the first place this means that when a number of tenders are out, one has often to put up between fifteen and twenty thousand dollars' worth of deposit cheques, and as these cheques are certified by banks there has to be actual cash to meet them.

Money is worth, at the present time, from 6 per cent. to 7 per cent.; hence it is easy to see that the interest alone runs into quite a respectable figure. Very often these marked cheques are cashed by municipalities, who make use of the money put up by the contractors to finance themselves with over a period.

We think that the custom obtaining in England whereby, to secure that only bona fide people apply for the specification, a deposit of one to two and occasionally five guineas is demanded, which deposit is always refunded when the tender is sent in. In addition, of course, the tenders have to be indorsed by two sureties or a bonding firm for the due fulfilment of same. We see no reason why this should not fulfil all the conditions obtaining out here.

Failing this, municipalities and others who insist upon a deposit cheque should agree to pay the current bank rate of interest, whether they cash the cheque or not.

Yours truly,
Canadian Boving Company, Limited.

Montreal Contractor Upholds Substantial Deposits

Editor Contract Record,

I do not agree with the general statement that substantial deposits with tenders are not desirable. During the last five years in Montreal we have seen a dozen failures of important contracting firms and a great many more of smaller ones. In looking over a list of eight tenderers on a reinforced concrete job that was put in five years ago I find that five out of the eight have since failed and it was the two men who were lowest on the list who were the unfortunate ones. There is no doubt in my mind that the estimating and cost-keeping end of contracting work generally is not given sufficient attention. The men who put in bids which are far below all the others are usually found to be those who have not conducted their estimates properly or who have an inaccurate idea of costs. The deposit of five or ten per cent. which is asked for in government and municipal work, and also, in some cases, by private companies, has a very healthy effect upon the persons tendering. It makes them much more careful and it excludes the irresponsible men who would not have the means to carry out the contract if it were awarded to them.

Yours very truly,
E. G. M. Cape.

Maintenance Guarantee Discussed

Editor Contract Record,

We give below your questions and our answers and arguments.

(a) Are contracting interests affected adversely by a requirement of, say 5 per cent. of the amount of the tender?

Our experience is that such a deposit injures no one.

(b) Is such a requirement necessary in the interests of the authorities?

We believe such a requirement, necessary, advisable and just.

(c) What alternative would you suggest?

Provided we object to such a requirement we would suggest that in lieu of a cash deposit in the form of a marked cheque, a surety company bond accompany the tender. This bond would guarantee that the contractor would execute the contract if awarded to him, failing in which, the sureties would be bound to reimburse the corporation or person letting the work in an amount sufficient to cover the difference between the successful tenderer's contract price and that of the next higher tender; or if the work were readvertised by reason of the successful tenderer failing to execute the contract, then such damages should be paid as would reimburse the corporation for all expenses.

In further answer to question (b) we believe that the interests of the authorities are safe-guarded much better by a cash deposit than by a bidder's bond, as no time is lost in realizing on the cash deposit, or, as it might be termed, cash bond.

The authorities have visible evidence that the contractor has some financial standing and the larger the amount required as a deposit the larger financial standing or credit the contractor must have. With a large cash deposit or cash bond, the less likelihood exists of the low bidder being bought off by other contractors. The responsible contractor is really benefitted by such a requirement as it tends to eliminate the irresponsible or inexperienced contractor, who may not have sufficient capital to properly execute the contract.

The practice of holding marked cheques for long periods is wrong and should be abolished. Within a reasonable time, say seven days, all cheques should be returned but that of the low tenderer and his two competitors next in order. These two should receive their cheques as soon as the contract is awarded and not later than two weeks after tenders are received. Where a custom exists of opening tenders in public and of awarding contracts to the lowest tenderer, all cheques but that of the low tenderer should be returned within 24 hours.

A better requirement than that of requiring a deposit of any fixed percentage of the tender would be for the engineer to fix a lump sum for the deposit, so that competitors would have no way of ascertaining the approximate amount of any tenders prior to the award of the contract. This fixed amount should be dependent on the size of the proposed contract and the nature of the work contemplated.

A matter of more importance than this question is that of requiring a retention of 5 per cent. or 10 per cent. of the contract price for a period of one, five or ten years as a guarantee for maintenance, or in lieu of a maintenance bond

If a performance guarantee is desirable it should be provided in the form of a fair, safe bond issued by a surety company of good repute.

Yours very truly,
A Western Firm.

Substitution of Bond

Editor Contract Record,

In regard to the deposit required by owners and engineers in connection with private and public work in the west, a deposit is asked for only by municipalities, corporations, and the provincial governments.

In the case of corporations, we are always able to substitute a bond for the deposit after the tender is accepted and before the contract is signed. The cost of this bond we endeavor to have incorporated in our figure before putting in the tender; that is, we try to have the customer pay the cost of the protection that is given him.

In cases where a bond is not acceptable, however, it is certainly a handicap to require a deposit of anything more than 5 per cent., and undoubtedly it prevents many tenders from being put in which otherwise might be favorable and satisfactory to the customer.

Yours truly,
The Manitoba Bridge and Iron Works, Limited.

Five Per Cent. Deposit Necessary

Editor Contract Record,

We have no objection to a deposit so long as the amount does not exceed 5 per cent. of the amount of the tender and if the matter is settled immediately, so that the loss in interest is not important. We think that the authorities are right to ask for deposit cheques, as otherwise representatives of foreign firms might put in tenders on their own account, taking a chance that their friends would accept the contract when awarded. If not, they would simply withdraw their tender. We cannot suggest alternatives.

Yours very truly,
Escher Wyss & Company.

Contract System on "Poor Basis"

Editor Contract Record,

Answering your questions in order we would offer the following:

(a) You ask if contracting interests are affected adversely by a requirement of, say, 5 per cent. of the amount of the tender.

For small contracts a 5 per cent. security cheque is only a reasonable precaution, but as soon as the contract is let the cheques of the unsuccessful bidders should be returned at once and the cheque for the successful bidder should also be returned just as soon as the contract documents are executed. Cheques should not be held after the contract documents are executed and if the parties are not satisfied that the contractors to whom they have awarded the work are able to carry out the contract without holding a few dollars security, then it seems poor business to give the contract to such a weak party. Take for instance a rural municipality holding a cheque of $150 to ensure the proper carrying out of a small highway contract and for which regular contracts have been executed. In our opinion this is the height of nonsense, but it is frequently done.

(b) You ask if such requirement is necessary in the interest of the authorities.

We have already answered this, generally, by saying that on small contracts 5 per cent. security deposit is not unreasonable as it protects the purchasers to a certain extent from irresponsible parties. Even on small contracts, where no security is required, there are always several irresponsible parties bidding and the result is that when the tenders are opened if they are not satisfied with their standing they can withdraw without loss to themselves; or, as we have known to happen on several occasions in substructure contracts, a low man can be induced to withdraw, probably for a consideration or an interest in the contract of a higher bidder. This could be largely done away with if security were demanded. On large contracts a smaller security should be asked for. Also, as above stated, all security cheques or deposits should be returned promptly; otherwise, it ties up altogether too much money.

(c) What alternative would we suggest? We think the above remarks answer this question also.

We might say that the system of tendering and letting contracts in Canada is on a very poor basis. Cities and large towns have a general bidding form covering roadway work, sewers, waterworks, pavements, bridges, etc., and the terms of it are so indefinite that very often it is impossible to make your meaning clear without making your tender informal. Also, specifications sent out by many cities and large towns are so indefinite and so antiquated that it is difficult to figure intelligently. The sooner cities, towns and corporations make up their minds to handle all questions in connection with tendering and letting of contracts on a business basis, the better it will be for themselves and for contractors.

Very truly yours,
An Eastern Contracting Firm.

English Practice Dangerous Here.

Editor Contract Record,

If open bidding is permitted there should be a cash deposit or bond accompanying the tender. This will eliminate irresponsible bidders. We notice your comment in reference to the small deposit called for in England. This is probably due to the practice of inviting only responsible companies to submit tenders on work, and would be a very dangerous practice if the work were publicly advertised. Answering your questions:—A—Yes. B—Yes. C—The bond of some surety company, satisfactory to the Government.

Very truly yours.
The Foundation Company, Limited.

Sliding Scale Suggested

Editor Contract Record,

Replying to your recent letter, I would express the following opinions:—

(a) Contracting interests are certainly affected adversely by the requirement of a 5 per cent. tender cheque in such cases where the cheque is held by the authorities until the completion of the work, as it undoubtedly reduces the amount of capital available for the contractor's operations and to this extent reduces the scope of his work.

(b) Some such requirement, however, is necessary in the interest of authorities, in order to prevent tenders being made by irresponsible parties, which is an all too common occurence in this western country, the result being that where no deposit is required, the contractor may make some kind of a start and then quit the work, causing trouble and expense to the owners and often considerable damage; or the contractor may refuse to undertake the contract at all, if he finds that he has made a mistake—again causing trouble, expense and delay.

(c) I would say that the most satisfactory arrangement from both points of view is to ask for a deposit with the tender of a reasonable amount, varying from say 5 per cent. on a small contract to 1 per cent. on a large one; and upon the contract being awarded, to require a guarantee company's bond of, say, 20 per cent. to 30 per cent. from the contractor, and to return him his tender cheque upon production of the bond. Any reputable contractor can get such a bond from the guarantee companies for a very small premium, which would be no burden at all. In this way the whole of the contractor's available capital could be actually used in his operations.

Yours very truly,
John Haddin,

Road Work at Winnipeg

INTERESTING details concerning paving construction at the city of Winnipeg are furnished this journal by Mr. W. Aldridge, of the City Engineer's Department.

The Winnipeg streets are mostly 66 feet wide. The three principal streets are 132 feet and a few others are 99, 49½ and 33 feet wide. The average pavement is 24 feet wide, walk 6 feet and boulevards about 14 feet. On business streets and where there are street railway lines, the pavements are 46 feet wide and the walks 10 feet. On Main street and Portage avenue there are 96-foot pavement and 18-foot walks.

On all permanent work the Street Railway Company uses 7-inch 80-lb. rails. Granite setts are laid next to the rails and asphalt is placed between setts.

Sheet Asphalt

Specification—3 ins. gravel sub-base; 6 ins. 1-3-5 Portland cement concrete; 1½ ins. binder and 2 ins. surface.

Grading—The city being practically level, the grading averages about 12 inches and is done by means of ordinary scrapers.

Concrete—The city has in use four portable concrete mixers on pavement work. Two of these have belt conveyors for distributing concrete on the road and have a capacity of 1,500 sq. yds. of 6-inch concrete per day each. The machines are driven by gasoline engines.

Asphalt—The city owns a stationary asphalt plant situated on the Winnipeg Transfer Railway and a portable railway plant at present at the city yards. The latter is a Cummer one car plant and has a capacity of 1,800 sq. yds. of binder or surface per day of ten hours and the former has a capacity of 2,000 sq. yds. of finished pavement per day, i.e., binder and surface. The materials are all handled mechanically.

This plant has been built by the city and the greater part of it after the city design. This spring the steam power has been done away with and electric motors substituted on account of the cheapness of electric power in the municipality, and the increased facility of handling justifies the change. The boilers are still used for heating kettles.

The materials are delivered on the street by horse-drawn wagons principally. The city has also two gasoline tractors, a steam tractor and a motor truck. There are 81 miles of sheet asphalt, averaging about 30 feet wide, in the municipality.

Asphalt No. 2—This pavement consists of 4½ ins. of Portland cement concrete laid on 3 ins. of gravel and covered with a 2-in. layer of asphaltic concrete. The surface mixture is made on the street in a portable plant made by the Link Belt Company, of Kansas.

Cedar Block

This pavement consists of a cushion of sand on which is laid two layers of 1-inch boards, placed diagonally in opposite directions. On these boards are laid 5-inch cedar blocks.

For curbing 4 x 10 timbers spiked to cedar posts driven three feet into the ground, are used. This pavement is for lanes only. There are 26 miles of cedar block paving in use.

Macadam

Macadam pavements consist of 10 inches of broken stone laid on the mud grade, with, of course, usual side and cross drains. The coarse stone is at the bottom with finer on top. These pavements, with reasonable repairs, serve well on residential streets with very light traffic and look well.

The curbing used on macadam and also on the asphalt pavements is a concrete curb faced with granite and cement mortar. There are 35 miles of macadam in the city.

Cost Data

Asphalt	per ton	$25.00
Sand for surface mixture	per cu. yd.	1.05
Limestone dust for filler in surface mixture	per cu. yd.	1.15
Limestone	per cu. yd. on job	1.75
Cement	per cu. yd. on job	
Gravel	per cu. yd. on job	1.75
Crushed Granite	per cu. yd. on job	3.00

Asphalt No. 1 costs $2.75 per sq. yd. on the average and No. 2 costs $2.10 per sq. yd. Macadam costs $1.10 per sq. yd. and concrete curb and gutter 70c per lineal foot.

Cedar Block Pavements

Gravel cushion	per cu. yd. on job	$ 1.75
Foundation boards	per 1000 ft. B.M.	25.00
Cedar blocks	per sq. yd.	.60
4 x 10 curbing	per 1000 ft. B.M.	24.00
Cedar posts	each	.10

The pavement costs $1.50 per sq. yd. and curb 35c per lineal foot.

Mr. G. M. Gest, of Montreal and New York, has been awarded the tender for the construction of a system of underground conduits for the town of Outremont, P.Q. A twin system will be built, one set being used by the town for the distribution of light and power in the future, and the other system by the Bell Telephone Company. The town originally accepted the tender of Dietrich, Limited, Montreal, the price being $81,000, as against $98,000 asked for by Mr. Gest. This decision was against the recommendation of Dr. L. Herdt, the consulting engineer, and the Bell Telephone Company, who were strongly in favor of Mr. Gest's tender on account of the wide experience Mr. Gest has had in this class of work. On the understanding that Mr. Gest was given the work the Bell Telephone Company agreed to pay 50 per cent. of the cost of $98,000, and 47 per cent. of the extras and costs of re-paving, in addition to the sum of $2,000 to cover engineering expenses and inspections. This was in lieu of 47 per cent. of the total contract originally agreed upon by the company. The Council in accepting the tender of Dietrich, Limited, inserted some stringent provisions into the contract and Dietrich, Limited, after consideration withdrew their tender upon which the Council accepted that of Mr. Gest. On the Council's acceptance of the tender of Dietrich, Limited, Dr. Herdt disclaimed all further responsibility for the work. Mr. Gest has undertaken to complete the conduits [illegible]. Altogether five tenders were sent in for the work.

The contract has been awarded to the Canadian Westinghouse Company [illegible]

Road Practice of the City of Westmount

Various Types of Pavement Described in Detail—Rolling, Binding, Picking and Scarifying—Macadam Roads and Dust—Laying Mediums

By A. Currie, City Engineer

THE city of Westmount, Quebec, occupies an area of approximately one thousand acres. Contained in these one thousand acres are the following roadways: Macadam, 8.592 miles; tar and asphalt-mixed method, 1.21 miles; tar macadam-penetration method, 2.32 miles; macadam-tar painted, 6.93 miles; asphalt-surface pavement, 6.036 miles; bitulithic-surface pavement, .30 miles; concrete pavement, .80 miles; giving a total of 26.188 miles. There are also: sewers, 28.538 miles; concrete sidewalks, 45.62 miles; concrete curbs and gutters, in addition to the sidewalks, 11.48 miles; block crossings, 1.738 miles.

The ordinary macadam roads are built on the principles laid down by MacAdam and the stone used is banc rouge.

City Engineer Currie.

There are considerable differences of opinion as to the best sizes to which stone for macadam should be broken. There are also differences of opinion as to whether hand-broken stone is superior to stone broken by machinery. At present the sizes that are most in favour are 1¼ in., 2 in. and 2¼ in. gauge. No definite rule can be laid down as to the sizes of stones. Telford and MacAdam agreed on a weight of six ounces for each stone. This gives a size of about 2½ in. gauge. Some engineers prefer different sizes for different classes of work—2¼ in. and 2½ in. gauge stone for new roads and re-coating work and 1½ in. and 2 in. gauge stone for surface work repairs. The pieces of metal should be as nearly cubical as possible. Irregularly shaped metal will show a great deal more crushing under the roller or traffic. There is little doubt that hand-broken stone is better than machine-broken stone. The latter shows a tendency to flaking and has its angle somewhat abraded and rounded. There is little choice in the matter, however, the hand-breaker being a disappearing quality. The work requires knack and is exhausting, and the number of men who follow it now is small, it being only a question of time before hand-breaking becomes extinct. The cost of hand-broken stone, is, therefore, necessarily dearer than machine broken; and the daily amount the hand-breaker can do is a very variable quantity, depending on the hours of labour and the class of stone to be broken. As a rule, in nine hours a good workman will break from two to three cubic yards of the softer road metals, such as lime stone, flints, etc., while he can rarely manage more than one cubic yard of the tougher rocks in the same time. The amount of broken stone turned out by a machine depends on the type of machine and its size, but the latest machines will produce an average of sixty tons a day.

The advantages of machine-broken metal are its more regular size, due to screening, and its cheaper cost, but it is rarely as cubical in form as hand-broken. In the newer machines there is less damage to the metal, and although in several cases hand-broken stone comes out better than machine-broken stone in the same quarry the difference is very small.

Steam Rolling—Steam rolling no longer requires any advocacy or defence. It is now part of the operation of road-making and is equally necessary for either new roads or repairing work. The advantages may be shortly summed up as:—(a) a saving in time and metalling, a thinner coat of the latter being required. (b) A good smooth surface, affording easy traction and comfort to the traffic; quickly and cheaply constructed. (c) The obvious disadvantages of consolidation by the traffic are avoided. Of these may be mentioned the absence of loose metal, kicked about and wasted, the discomfort to the horses, damage to vehicles, loss in time in traversing the new metal, and the extra cost of labour involved and the necessary raking during this method of consolidation. (d) The saving in binding material and the evidence of mud and horse refuse being mixed with the binding; also, less dust and mud. (e) A more impervious surface.

Steam rolling has some disadvantages: (a) The rollers sometimes frighten horses and authorities have had to pay heavy damages for injury in accidents arising in this way. This, however, is not very considerable at the present day. Horse-dealers recognize that horses must be broken to all kinds of cycle, motor and steam traffic. Horses that are not so broken should

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*Mr. **Archibald Currie**, City Engineer of Westmount, was born in Glasgow 44 years ago and was educated in that city and at the West of Scotland Technical College, graduating in 1890. For three years he was assistant engineer with Sir John Aird & Sons, contractors, in London. He then accepted an engagement with the Chinese Government as resident engineer in charge of important engineering works in the north of China. Later, Mr. Currie went to South Africa and remained there for nine years, six of which he spent in Johannesburg, where he was in charge of electric railway, drainage and road construction. Upon returning to Great Britain, Mr. Currie engaged as consulting engineer on water supply works and similar enterprises in Ireland, Scotland and Wales. Coming to Canada he was appointed early in 1911 to succeed Mr. F. L. Fellowes, now City Engineer of Vancouver. Mr. Currie is resigning at Westmount [illegible] City Engineer of Ottawa.

not be allowed on the streets. (b) Some kinds of road stone have been crushed under roller. This may be due to the use of a too heavy roller, but if metal is crushed under a roller of ten or twelve tons' weight it is obviously unfit for use on a road.

Rolling—The amount of consolidation that can be effected in one day is too variable a quantity for a definite statement. Much depends on the nature of the construction, thickness of the coat rolled, etc. The number of times a roller must pass over a given point to secure consolidation increases—(a) In proportion of the hardness of the stone; (b) according to the thickness of the layer, but not in proportion to it; (c) if the stone is dry.

The writer has found, from statistics kept for several years, that for a layer of broken stone, three inches in thickness, a twelve-ton roller must pass over—limestone, 50 times; granite, 50 to 75 times.

The stone is invariably watered, as this assists consolidation and decreases crushing under the roller, but the water must be applied carefully and not so plentifully that it soaks through to and weakens the road-bed. The metalling, when laid, should be rolled in the dry state two or three times.

The effect of rolling on the metal is—(a) To close the pieces of stone and to eliminate the voids. This would be done better if the stone could be shaken as on a tray. Rolling, however, is the only possible method of squeezing into any available void and so filling them up. If metal of a certain uniform size is used the proportion of voids is 50 per cent. If metal of various sizes is used, the proportion will be about 40 per cent. Rolling will not reduce either percentage more than 20 to 25 per cent. A well rolled macadam road contains from 70 per cent. to 80 per cent. of stone. (b) To crush the angles of the stone—It is obvious that in rolling, the angles must, to some extent, be damaged. Rolling does roughly what shaking the metal would, if it were possible, effect kindly. This crushing tendency is deleterious to the metalling and must be minimized as much as possible, consistent with due consolidation.

Binding—Road dirt, i.e., the mud scraped from the road and deposited at its sides, was once generally used as a bind for any new metal put upon the road. The practice is still in vogue in many places. Its principal merit is cheapness. The fact that the road has rejected it in the form of mud should be a strong reason for not putting it on the surface again. Sand is one of the principal materials in use. Mr. T. Aitken is an advocate of sand mixed with screenings from the stone breaker, and in renewing the road with a thick coat of metal invariably applies this mixture. Mr. G. Tillson (U. S. A.) is against the use of sand, which he says can only be cementitious when it contains a considerable proportion of loam, which is a deleterious substance. Clean, sharp sand has no binding effect. He advocates fine screenings, especially of lime-stone. Trap rock screenings and sand, in the proportion of three of screenings to two of sand, gives good results. Trap and other igneous rock screens have little cementitious value and if the binder is composed solely of these it will require a considerable amount of rolling. Mr. F. Latham inclines to the use of earthy materials, observation on his part having shown that if screens alone are used, as much as 30 per cent of them have to be reduced to grit and mud by rolling before the road surface is thoroughly consolidated. As a case in point he mentions a hilly road that was repaired, the binding employed being screenings only, going to pieces in a fortnight, when fresh repairs had to be done. On the second occasion a small amount of road dirt was used with complete success and the rolling only took two-thirds of the time occupied in the previous repairs.

The binder should be scattered over the surface of the road in advance of the roller. If dumped in piles and then spread there is apt to be too much used in some places. The sprinkling cart should follow the spreading of the binder, and should be followed immediately by the steam roller. In Westmount, instead of using a sprinkling cart, a hose pipe 1½ in. in diameter, was laid to the nearest hydrant and water sprinkled on the road. The advantage of this practice is obvious, as only one man was used, whereas with a sprinkler cart it means a driver, horse and cart.

The wet bind or grout should be continually swept across the surface as the roller passes and repasses over the metal. On all hands it is agreed that the binder must be used sparingly. Too much binding will keep the pieces of stone apart, will be washed out in wet weather, and cause the smooth surface of the road to subside. In effecting repairs scarified metal is sometimes taken out and screened, the residue of fine stuff being employed to bind the new metal placed on the roadway.

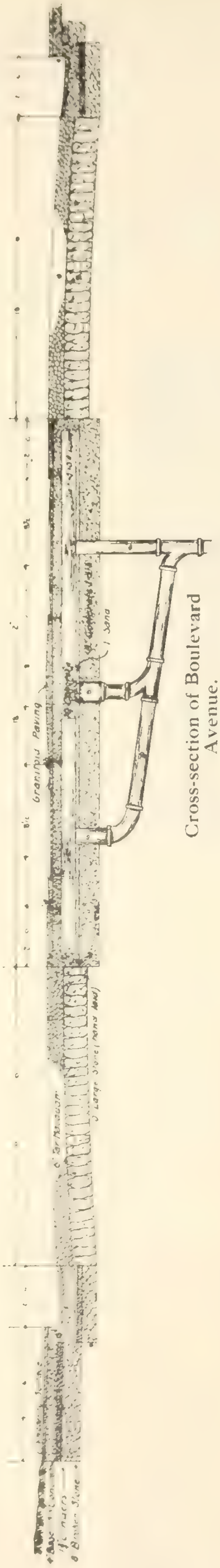
Picking and Scarifying—Scarifying machines have become more popular of recent years; though some engineers still have objection to their use. It is claimed, however, that a better union can be effected between the new and old metalling if the latter is first scarified. The mechanical scarifier in a given time, will of course, do a very much larger amount of work than can be done by hand picking in the same time.

Scarifying machines are of various types. The machines apparently in general use in this country are in the form of a plow hauled behind the roller. This has many disadvantages and in the end can not be regarded as altogether satisfactory. A form of scarifier in use in other countries is one attached to the end of the driving wheel of the roller and can only be operated by the driver of the roller. The writer, last year, recommended the City Council of Westmount to purchase a Ruston-Proctor Roller with one of these scarifiers attached, and which, during a season's work, proved very satisfactory.

Whether a road should be picked or scarified before adding fresh metal is a question upon which engineers are divided. If the road is a good one, and has merely worn down evenly, the metal may be laid without the old surface being previously scarified. But in such cases it is usual to make a cut at the sides of the road, so that the new material may, so to speak, be bound in at the edges. In cases where only the contour of the road is faulty, the surface is frequently scarified; the metalling, with the addition of a little fresh stone, is raked into proper contour and again consolidated. In nearly all roads, however, the crust contains a large amount of fine dust and broken down material, the major part about pea gravel size; and as this material has become or soon will become unserviceable, it is desirable to eliminate it and this is effected by screening the existing metalling after the road has been scarified. Additional metalling is added and the whole consolidated.

In carrying out long stretches of recoating work the value of the scarifier is more apparent, but when the patching system is in force, the relative economy by mechanical scarifying or hand picking is still a matter of dispute. A number of engineers only pick

Cross-section of St. Catherine Street.



Cross-section of Boulevard Avenue.

a furrow round the edges of patch so that the new metal is bound in. A good deal depends on the thickness of the coating to be applied. If the metal is only one stone thick it may be considerably crushed by the rollers unless the surface had previously been picked or scarified.

Macadam Roads and Dust Laying Machines—Road engineers have been confronted with a dilemma in connection with ordinary macadam roads; motor traffic has lead to increased wear and tear and consequently to greater expense in upkeep—a very serious matter in rural districts—and to great trouble with dust. To cope with the latter evil recourse has been had to various dust-laying mediums, ordinary watering having proved quite ineffectual. These dust-layers may be practically separated into three divisions. (1) Deliquescent salts, as calcium chloride, which by attracting moisture from the atmosphere keeps the surface of the road slightly damp. (2) Crude petroleum oils, those with an asphalt base, usually emulsified with ammonia or other alkali to facilitate its application. (3) Coal tar, either in crude or refined state. Oil tar, a waste product in the manufacture of carburetted water gas, has also been used, but its unpleasant "gassy" odour militates against it.

Calcium Chloride—A solution of calcium chloride has been successfully used for dust laying. Where carriage is a heavy item, it is cheaper to buy solid calcium chloride and dissolve it to the required strength. It is advisable to make the solution in a separate tank and when thoroughly mixed to transfer to the water cart. The calcium should be placed in a wire gauze about ½ inch mesh, near to the top of the cistern, when it will be rapidly dissolved, and very little stirring will be necessary to make the solution of a uniform strength before it is run into the water cart and used.

Emulsified Oils—The emulsified oils have not been a success from a financial standpoint. The increasing demand from Texas and other heavy oils and the heavy cost of freight make the raw material of these dust layers expensive, and though their effect is possibly more lasting than calcium chloride the expense becomes so much greater that their use is not so economical. The writer has tried all these methods and has come to the conclusion that good tar properly applied is the cheapest and best dust preventative and preservative of macadam roads being both effective and durable. The quality of the tar is very important, if it is heated too much and refined too far it becomes brittle and makes black dust, if not sufficiently refined and the light oils taken off, it will disintegrate.

Before tarring a road surface the weather should be warm and the road thoroughly brushed and cleaned. The tar should be heated to its boiling point at convenient positions on the work and should be applied as hot as possible, so that it may flow freely. Immediately on application the liquid tar should be brushed so far as necessary to ensure regularity in thickness of the coating. The quantity of the tar required will vary according to the physical conditions of the road, but generally in the case of a road to be treated with tar for the first time, the quantity should be one gallon to coat from five to seven superficial yards.

If the road must be opened for traffic before the tar has set hard, grit should be spread on the surface to prevent the tar from adhering to the wheels of vehicles, but gritting should be delayed as long as possible, and the quantity of gritting material to be spread should be no more than sufficient to prevent the tar from adhering to wheels. Stone chippings, crushed gravel, coarse sand, or other material (free from dust) not larger than will pass through a ¼-in. square mesh should be used for gritting, in quantity not exceeding one ton for 300 to 350 superficial yards if grit is used, and one ton for 200 to 250 superficial yards if coarse sand is used. Precautions should be taken to prevent liquid tar passing directly through drainage gratings or outlets.

TAR MACADAM ROADS

Generally—Tar macadam is a comparatively new road material. As a material for footways it has, in differing forms long been used. In some of the northern towns of England it has been used for roads for some years past, but its increasing employment is mainly due to the development of the motor and cycle traffic, and to the attempts that are being made to cope with the "dust problem." Tar macadam has hardly been tried for roads on a sufficient scale to speak very definitely about its economic value. Its superiority to ordinary macadam is generally acknowledged. Some of its advantages however, in this respect may be summed up as follows:—

(1) It is more unperishable. The metal being coated and partly permeated with a viscous coating of tar, the stone does not absorb water. The surface coat is finer than ordinary macadam, and has less voids in it, so that water does not penetrate so easily.

(2) It has a longer life. The tarry coating besides preserving the stone from the influences of the weather, largely nullifies the attrition accruing in ordinary macadam, and the tar is a better binder than any of those employed. In general the road is more homogenous and elastic.

(3) It is practically noiseless.

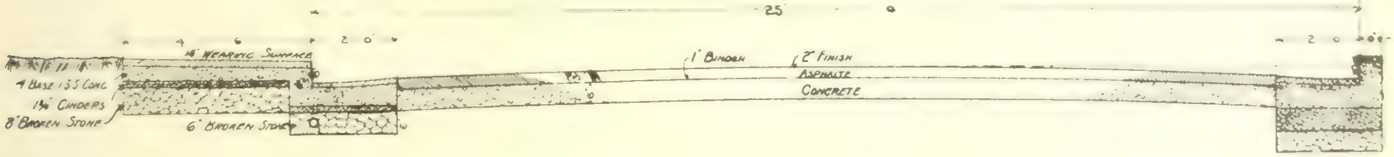
(4) It preserves a smoother surface than ordinary macadam. Dust is reduced to a minimum, so that the cost of scavenging and watering are practically avoided.

(5) The cost of maintenance as regards repairs, is less.

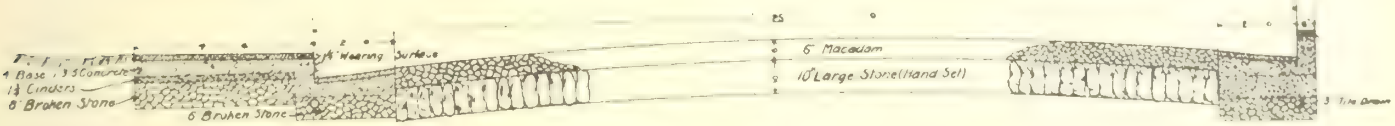
Its disadvantage is that of slightly greater initial cost but this is compensated for by its longer life. One engineer has complained that the surface is apt to be slippery in frosty weather and others have urged that the surface will become soft and sticky under hot sun. In most cases it is mentioned as suitable for "light traffic" or traffic "not too heavy." From this it might be erroneously inferred that tar macadam is inferior to ordinary macadam as regards wear. Tar macadam will take heavier traffic than ordinary macadam, but that it can be substituted for the necessary pavements in the streets of big towns and cities is too much to suppose. Its chief purpose will be to supersede ordinary macadam in small country towns and villages, main country roads, and suburban and residential quarters of big towns and cities.

MATERIALS FOR TAR MACADAM

Stone—The stone most recommended for tar macadam is limestone, but iron slag has been found equally good and is of greater strength. Many satisfactory roads have been made with a mixture of limestone and slag. Some of the igneous rocks have been tried, but as a rule, these are too compact or crystalline to absorb any appreciable proportion of the tar, which therefore remains as a surface coating that easily wears off. A few engineers have, however, employed igneous stone and have been satisfied with the results, so that the question is still open. Derbyshire dolomitized limestone, Kentish rag and the Scarborough gritstone have been largely employed for tar macadam. Mr. Purnell Hooley, who has long studied and experimented with this material, is an advocate of iron slag, and he is the patentee of a specially prepared brand of tar macadam. The question of adding coke-breeze or other fine material to the topping coat is one in dispute. At Harrogate 12 per cent. of coke breeze is invariably added, and the Borough Engineer finds the topping coat improved thereby.



Sketch of typical asphalt roadway.



Typical macadam roadway.

Tar—The tar requires very careful watching. As previously mentioned, the surface of tar macadam has in some instances become exceedingly sticky and troublesome in hot weather; in some cases so much so that pedestrians' boots have stuck to the road and have had to be left there. This is due to—(a) the stone used not being suitable; (b) the material not being properly prepared; (c) the tar being defective.

In nine cases out of ten defects in tar macadam may be attributed to the tar. The tar produced by different works varies very much in quality. The most recent tar-extracting apparatus employed in gasworks does not appear to produce such good tar as formerly and the brand of coal used also has a bearing on the subject. Unfortunately, the difference between poor and good tar cannot at present be established by analysis; samples of both appear chemically the same. The advice given by one well-known engineer is to find a gasworks producing good tar, and use only the tar produced there.

The tar macadam is laid on the roadway in three grades, over a good foundation, which is always shaped up to the proper convexity. The aggregate of the surface is composed of broken stone obtained in the vicinity: 60 per cent. broken to a size of 2½ in.; about 30 per cent. 2½ inches to 1½ inches, and 10 per cent.

[illegible] inch for closing up interstices. The last mentioned size is kept separate and used during rolling operations. The tar macadam, after being spread and levelled, is rolled into a smooth surface but not rolled to the same extent as an ordinary water bound macadam road. A ten ton roller is used for this work, as better results are obtained than when using a heavy roller. After the roadway has been opened for several weeks, a coating of tar is applied to the surface of the road and covered with stone chippings not larger than will pass through a one-quarter inch mesh.

PREPARATION OF MATERIALS

Engineers differ considerably about the preparation of materials, and no standardization is at present possible. Heating the stone dries it and renders it in a better condition to absorb tar. On the other hand, it is contended that artificial drying is detrimental and that it is better to dry the stone by storage under cover. It is doubtful whether the latter method can be effectual for though the stone is preserved from actual wetting, it will, in wet and humid weather absorb moisture from the air.

As to the necessity of boiling the tar there should be little doubt. Tar varies very much in the amount of volatile matter present and careful boiling for two or three hours will render the consistance more stable and render it more tenacious. If the tar is poor a little pitch can be added to enrich it. The boiling, however, must never be carried too far or the residue will be brittle. Considerable care must be exercised with the boiling. In preference to boiling, some engineers store their tar for some months before use, and in this case it is kept in concrete or iron tanks, set below the ground level and fitted with valves, etc., to permit the escape of volatile gas. The tar should, in this case be drawn from the bottom of the tank, and a pump must therefore be fitted to effect this.

TAR MACADAM PENETRATION PROCESS

A kind of tar macadam has been made by spreading a layer of coarse metal in the usual way and then pouring over it a hot mixture of tar. Upon this a layer of small stones is spread and then well rolled in. This is known as the "Tarvia Modern Pavement," and I venture to express the opinion that, so far, it has not been particularly successful in Westmount. We have a total mileage of about 2.32. This method of road making gives a good deal of trouble in summer, on account of the tar bubbling up and proving a great nuisance to both vehicular and pedestrian traffic. When the tar bubbled up like this on the streets, a coating of small chips had to be spread over it. From what one hears, this form of pavement has been successful in other cities, but personally, I cannot recommend it and I think it is very expensive, considering the results obtained.

The macadam and tar macadam roads in Westmount have been constructed generally on the principles outlined in the foregoing. One point not yet settled upon has been the foundation for macadam roads. The writer is strongly of the opinion that a Telford foundation is the best for local conditions. This foundation, as everyone is doubtless aware, is made of large stones placed on edge by hand with the interstices filled with small scrap. The usual practice of placing large flat stones from the crusher in the foundation does not commend itself, as experience has shown that even a flat stone will work to the surface and start disintegration of the road. It is difficult with machine broken stone to get the stones entirely cubical in shape.

ASPHALT PAVEMENT

We have in Westmount something like 6.336 miles of asphalt paving, including bitulithic surface. The diagram shown gives an average section as laid down in Westmount. The method of construction is pretty similar in all cases. Various brands of asphalt are on the market, of which I do not wish to pass an opinion on their merits or demerits. The bitulithic pavement has been down for four years and certainly has proved satisfactory. Other forms of asphalt namely, on Sherbrooke street, from Greene avenue to Victoria avenue have been down over two years and, so far, have stood traffic very well.

The vexed question of paving in the track allowance is one, perhaps, with which Westmount, like other cities, has had considerable trouble. Most of our track allowances laid in blocks are founded on concrete with an asphalt filler, with a sand cushion between the concrete and the blocks. While I may be subject to contradiction from persons knowing more about it than I do, I cannot see the advantage of this sand cushion and think it more of a detriment to the paving than otherwise. If moisture could be kept out, then it would be useful, but as soon as moisture gets in the sand starts to run, leaving the blocks suspended in one place and heaved up in another. In repairs to St. Catherine street, we tried setting the blocks in cement and next the running edge of the rail had a strip of concrete three inches wide against which the blocks abutted, and the blocks re-set in cement mortar entirely. This has proved better than the asphalt or pitch pouring in the joints, but I cannot altogether regard it as satisfactory. Had this been entirely used on new work, I think, perhaps, it would have been much better.

Towards the end of 1911, the Montreal Tramways Company laid a portion of concrete paving on St. Catherine street near Guy street, and observing that this had been a success, I recommended the Westmount Council to try this class of paving on Westmount Boulevard, the Tramways Company at the same time consenting to renew their tracks on the Boulevard. The foundation of the track was a slab of concrete eight inches thick, wide enough to take the ties, which were placed at two foot centers. The rails were brought up to grade with a packing of sand one inch thick between the bottom of the tie and the concrete slab. Above this, up to within two inches of the top of the rail, concrete was laid, and, before this concrete had taken its final set, a topping of two inches of concrete was laid. It will thus be seen that the sand under the ties was practically hermetically sealed in, thereby giving a good deal of elasticity to the track.

Particular notice should be taken of the concrete above the slab. This was in the proportion of one of cement, three of sand and five of stone, the stone to pass through a one and one-half inch mesh. The top mixture of two inches was composed of one of cement to one an done-half of three-quarter inch Banc Rouge screenings. A particular feature of the finishing coat should be noted, that it should be free from all dust. We tried to get granite screenings, but they contained somewhere about fifteen per cent of dust, which would have been a very costly matter to screen out.

Had deliveries been possible I should have preferred to use either granite screenings or small marble screenings from Vermont.

An interesting feature of this work was the draining of the track, which is shown on the accompanying diagram. The markings on the top were rectangular, running parallel and at right angles to the rails. This work was finished in the first week of November. It will be of some interest in the spring to see how this has stood the frost. This paving had expansion joints laid at fifty foot intervals and afterwards filled up with pitch.

Costs on the Construction of Concrete Pavement

THE following data on concrete pavement work are abstracted from a paper entitled Concrete Pavement—Methods and Cost of Construction, prepared by Carl M. Boynton, Inspecting Engineer, Universal Portland Cement Company, and presented before the American Society of Engineering Contractors.

An analysis of the material costs of one-course and two-course work will show that the difference is so very slight as to be doubtful of estimation. However close an approximation an estimate may be, it cannot be exact, and, therefore, it will readily be seen in the following formulas that the main consideration in choice of type of pavement must necessarily be dependent upon the materials available; and the type chosen will be that to which they are best adapted. This formula is based on Taylor & Thompson's Table of Proportion.

Considering: C equal cost of cement per barrel, G equal cost of gravel, per cubic yard, S equal cost of sand per cubic yard. Then, for one-course work of 1:2:3 mix, 7 in. thick, the material cost per square yard of pavement is .325C plus .0975S plus .146G; while for two-course work, 7 in. thick, composed of 1:2½:5 base, and a 1:1½ top mortar, the material cost per square yard of pavement is .342C plus .1045S plus .133G.

These two formulas show the tendency to equalize the cost by small compensating differences in the several quantities and are given here to illustrate this point.

With good equipment and an average gang the actual cost of mixing and placing should not exceed 7 cts. per square yard for 7 in. of concrete. To this should be added a cost of 3 cts. per square yard for finishing and labor necessary for handling the forms, making a total for one-course work of 10 cts. for mixing and placing. As has been stated, there is a slight difference in the cost of placing single and two-course work, with the advantage in favor of the former.

Placing expansion joints is such a simple operation that 1 ct. per square yard should cover the cost. To this must be added the cost of metal joint and tarred felt delivered on the job, or the cost of filling the joint with a plastic filler.

On city streets the water supply is not a problem; but on country highways, where it is necessary either to haul or to pipe water a considerable distance, it is advisable to make a careful survey of the situation. In estimating the cost of water the amount required for keeping the pavement damp for a period of five days must not be neglected, and as this is an indefinite quantity dependent upon weather conditions, only an approximate cost can be estimated. On the Wayne County, Michigan, work the water for each road is costing $3.50 per day (the wage for a man looking after the pumping), plus oil and gasoline required in operating the engine and pump. Water for the Mukwanago Road in Milwaukee costs 1¼ cts. per cubic yard of pavement. In this case the water is purchased from the city of Milwaukee or its suburbs. In both cases the contractor's and builder's equipment must include the necessary engines, pumps, pipings, etc.

The cost of hauling water for use in constructing country highways of concrete is often an item worthy of careful consideration. The method of supplying water by piping is considered by the majority of contractors as most economical. Where water is available under sufficient pressure the pipe line can be attached directly to the city main, thus eliminating engine and pump, but where water is taken from a well, creek or river in vicinity of work, an engine and pump will be required. The cost of gasoline engines varies with rated horse-power from approximately $105 for a 2 h.p. engine to $320 for a 9 h.p. The cost of pumps would vary according to the capacity pressure required and the conditions under which work would be performed.

On one job in the vicinity of Milwaukee, 7,200 lin. ft. of 2-in. pipe at $6.80 per 100 ft. cost $489.60, and the laying, $20 per mile, amounting to $27.20, makes the total cost $516.80, or $0.72 per foot. On the other job 11,200 ft. of 2-in. pipe cost $1,008 laid, or $.09 per foot. For supplying water, the city of Milwaukee received $.005 per cubic yard of concrete mixed and $.005 for each square yard of pavement, making a cost of $.00583 per square yard of finished pavement.

Where the construction is small, the installation of efficient pumping equipment may not be justified, in which case hauling in tank wagons can be resorted to. One team hauling tanks having upwards of 350 gals. capacity will supply a mixer of 1-3 cu. yd. with sufficient water for a day's run, provided the haul is 1½ miles or less. On one job of 4,800 sq. yds. in Wisconsin the water cost $75 for the entire work, plus the cost of hauling and pumping, which was $7 a day for 19 days. Another contract was $10 for water and $4 a day for hauling. This work covered 3,500 sq. yds., but the haul was short and one team working half a day could keep the mixer supplied.

In discussing the cost of concrete pavements, a few examples of actual construction will help to make clear the division of expense. The first pavement was laid recently in a small town in the central part of Illinois, totaling 5,000 sq. yds. The total cost of the work was $3,964.02, excluding cost of equipment, which consisted of a ½ yd. Koehring mixer of the latest type and a 1½ h.p. gasoline engine, and also excluding the cost of the water for mixing and sprinkling. The pave-

[illegible] was 12 ft. wide and uniformly 6 in. thick. The cost of the work was divided as follows:

Superintendence	$ 140.00
1,457 bbls. cement	1,547.15
Sand, stone and gravel	1,284.97
Labor	560.07
Lumber and forms	35.00
Bitumen and creosoted blocks for joints ..	48.67
Coal and oil for mixer and engine	30.75
[illegible]	307.41

A summation of these figures gives the cost of this road as $4.76 per cubic yard or $0.79 per square yard.

During the summer of 1912 Milwaukee County, Wisconsin, constructed several concrete highways to the south and southwest of Milwaukee. Data on a two days' run from one of these jobs were collected. Twenty-four men and a 1-3 yd. Smith mixer of the dumping type were able to place 94.1 cu. yds. or 470 sq. yds. of 9-ft. road 7 in. thick at a total cost of $354.41, exclusive of cost of grading and interest and depreciation on equipment. The materials were furnished free to the contractor on the siding nearest the work and hauled to the job at his expense.

In figuring the cost of the road, the cost of materials to the county was included with the cost of mixing and placing carried by the contractor, and are itemized as follows:

11.5 bbls. cement	$115.96
93 yds. bank-run gravel	94.86
Water piped from the city	19.27
Baker protection plates for expansion joints	29.07
Coal and oil for engine	4.00
Labor	101.25

This gives a cost per cubic yard of $3.98 and $0.79½ per square yard.

Another piece of construction work for Milwaukee was a road 18 ft. wide and 7 in. thick. The work was done by 20 men, using a ½ yd. Chain Belt mixer with chute delivery. The water was piped along the road from the city as in the preceding case, but a 4½ h.p. gasoline engine was necessary to force the water up to the head required. The work recorded covered a period of four days and cost $1,128.46, exclusive of equipment and grading. The cost of piping and water for this and the preceding job was fully accounted for in a former paragraph. The cost of the work was divided as follows:

414 bbls. cement	$430.92
92 yds. sand and 152.3 yds. gravel	340.84
Water	60.20
Baker protection plates for expansion joints	29.07
Coal and oil for mixer and engine	7.50
Labor	232.50

From these figures we arrive at a cost of $4.70 per cubic yard and $0.91 per square yard for the pavement.

In southwestern Michigan a short strip 798 ft. long, 9 ft. wide and 7 in. thick of 1:2:4 concrete cost $717.83, exclusive of grading, equipment and water. The equipment consisted of a 7 cu. ft. Clover Leaf mixer, necessary wheelbarrows and shovels and lumber for forms. The gang on this road was much smaller than that of any of the other roads. Details of the cost

225 bbls. cement	$234.00
69 yds. sand	37.59
136.35 yds. gravel	196.34
Gasoline and oil for mixer	10.00
Baker plates	96.00
Labor	144.00

This gives a cost per cubic yard of $4.68 and per square yard of $0.91.

In the west central part of Michigan 2,586 ft. of concrete 9 ft. 2 in. wide and .55 of a foot thick were constructed by a township as an experiment. A gang of 12 men using 7 cu. ft. side delivery Koehring mixer did the work for a total cost of $3,392.62, divided approximately as follows:

746 bbls. cement	$ 870.00
655.9 yds. sand and gravel	553.28
Baker protection plates and filler	170.12
Labor	1,690.50

These figures give a cost of $7.28 per cubic yard or $1.31 per square yard. Had the cost of grading, excavation and culverts been added to the above, the cost of pavement would have been increased to $8.73 per cubic yard or $1.46 per square yard.

The following work was constructed in the north central part of Illinois during October and part of November of last year. The road is 5,500 ft. long, 12 ft. wide and has a uniform thickness of 6 in. The total cost, not including water, macadam shoulders and equipment, was $7,089.42. The equipment consisted of a ½ yd. Koehring mixer, road grader, plows, scrapers, road roller and the necessary wheelbarrows and shovels. The cost was as follows:

2,274 bbls. cement	2,333.65
720 yds. sand	582.49
1,185 yds. gravel	1,787.93
Operative cost of mixer	51.99
Baker plates and creosoted wood blocks for expansion joints	160.03
Labor	2,282.52

The total of these figures determines the cost per cubic yard at $5.80 or $0.96 per square yard. No information was obtained on the cost of water for this work.

Over five million dollars will be spent immediately by the Toronto Harbor Board in dredging operations. Tenders closed last week and contracts will be signed within a few days. Five tenders for the work were received, two from Canadian firms, two from England and two from the United States. The dredging to be done includes the removal of 31,230,000 cubic yards of sand, and it will require approximately eight years to complete the work.

A reinforced concrete bridge comprising an arch of 57 ft. span and decking finished with solid parapets was recently tested under the load of 250 lb. per square foot by building a clay wall at each end and filling the tank so formed with water supplied through a 2½ in. hose pipe. Water can be very easily applied and removed in tests of the kind, and in many cases could be pumped from the river crossed by the bridge to be tested.

Fourteen million dollars is the estimate set by City Engineer Ruttan as the cost of bringing a supply of 25,000,000 gallons per day of Shoal Lake water to Winnipeg by a gravity system. This estimate is based on two pipe lines, the second to be started as soon as the first is finished. The first line, Col. Ruttan estimates, could be completed in four years from the time work is started, provided the work gets into the hands of experts who would rush it. It would take four years more to put in the second line, should this be decided upon.

Construction of Reinforced Concrete Pavements and Roadways

By H. S. Doyle

WITHIN less than a decade steel has received recognition as an important factor in the construction of country roads and city pavements. Steel constantly finds its way to the front ranks of new uses, and none the least of these is the part it plays in the building of streets and highways. Combined with concrete, steel, in the form of drawn wire, is rapidly taking a place in the engineering programme which contemplates a greater permanency to the already determined solidity of Portland cement when mixed in proper proportions with crushed stone and sand, and the future, it is believed, will witness a marked advance in this type of construction of routes of travel.

The main purpose of a pavement is the distribution of pressure over a great area, thereby decreasing the tractive power required. This applies equally to street and country roads, the only difference being a smaller tonnage hauled in the latter case. Decreasing the tractive power decreases the cost of marketing produce or manufactured articles. Authorities differ in estimating the cost of hauling a ton per mile on paved and unpaved roads. In Europe it is 8 cents per ton per mile on good paved roads, while in the United States on the average country road it is 23 cents per ton per mile.

Assuming these figures to be approximately correct, it is quite evident that the United States has a tremendous transportation cost to be overcome by the more general and scientific improvement in the highways if a more even distribution of the products of farm and factory are to be had. The work is going forward continuously, but this is a country of magnificent distances, and the civilization is comparatively young. It will be well to understand that the pavements and roadways of the future will be of a burden immeasurably heavier than any which heretofore has been the experience, for the reason that the internal combustion motor has reached a state of perfected development, and this motor furnishes the power which drives countless automobiles and motor trucks. What once were considered good roads under team traffic have become more or less valueless under this changed situation. At no distant date long as well as short hauls of farm produce and manufacturers' products will be made with auto trucks.

Plain concrete pavements and roadways have been built quite generally in various parts of the United States in the past ten years, and in that time it was quite natural that certain defects would establish themselves. A great majority of the difficulties encountered in the use of plain concrete pavement were eliminated simultaneously with the introduction of wire mesh reinforcement. At a small additional cost a permanent and in every way satisfactory pavement has been obtained, the extra cost for reinforcement varying from 5 to 15 cents per square yard, depending on the weight of reinforcement used. It has been shown that a high quality of pavement using only the best grade of material can be laid at an average price of $1.10 to $1.25 per square yard. Excluding the cost of maintenance, which is lower for concrete than for any other type, and assuming the life of the various types of permanent pavements to be the same, a saving in the first cost can be obtained by the use of reinforced concrete that could be used to pay for at least 50 per cent. of the total replacement cost when such replacement is found to be necessary. This saving, at 4 per cent. compound interest for twenty years, will amount to the original cost of the pavement, or in other words comparing a reinforced concrete pavement with the cheapest and best of other types, the original cost of the latter will construct a high class reinforced concrete pavement and replace it at the end of twenty years.

The comparative cost of various types of pavement in a number of American cities according to the best available data is contained in the following table. The showing is very much to the advantage of concrete:

Although the question of durability refers to the average life of a pavement, or, in other words, to the length of the period after which the pavement must be replaced, regardless of the labor and material that have been required to keep it in good condition during that time, the subject is connected here with main-

Reinforced Concrete Roadway, De Kalb, Ill.

tenance. Many of the present text books covering the subject of roads and pavements show maintenance cost as determined before the advent of motor driven vehicles, but these costs are very much lower than they are shown to be under present conditions of automobile traffic, this being especially true of the McAdam type of pavement. For durability a granite block pavement undoubtedly is superior to any other type, and is the only one more durable than a properly constructed concrete pavement. Brick pavements having the joints filled with asphalt, tar, sand or any other type of soft filler will not be as durable as a concrete pavement because these fillers do not prevent a chipping off of the brick.

An estimate of the life of several types of pavements made by D. W. Mead and published in the Journal of Associated Engineering Societies is as follows:

COMPARATIVE COSTS OF VARIOUS TYPES OF PAVEMENTS

LOCATION	YEAR	Average Cost Per Square Yard								REMARKS
		Macadam	Gravel	Concrete	Asphalt	Brick	Granite Block	Bitulithic	Wood Block	
Montesano, Wash.	1911	....	....	$1.27 to 1.32	$2.18	$3.15	....	....	....	Brick and asphalt on 5″ concrete base. Gravel $1.50 per yd.; labor $2 to $3 per day.
Richmond, Ind	1908	....	....	1.06	....	2.00	....	....	....	Brick price is minimum.
Panama, Cuba	1906–07	....	....	2.00	....	4.00	....	....	....	
Summerville, Mass.	*	....	....	1.65	3.80	2.75	$2.35	....	....	Concrete pavement—Hassam patents
Toronto, Can.	1903	....	....	1.74	....	....	....	....	....	4″ base, 2½″wearing surface.
Toronto, Can.	1904	....	....	1.92	....	....	....	....	....	Included gravel and 2″ tile drain.
Toronto, Can.	....	....	....	....	2.25	2.25 to 2.55	3.50	$2.25	....	
Denver, Colo.	....	....	....	1.03 to 1.27	3.47	....	....	....	....	
Chicago, Ill.	1905	....	....	1.80 to 2.20	....	....	....	....	....	Patented type—Depth of fill varies.
Chicago, Ill.	1905	....	....	1.75	....	....	....	....	....	Patented type.
Chicago, Ill.	1909	....	....	1.50	2.03	2.55	3.89	....	$3.44	Patented type—Concrete pavement, 6″ base, 2″ top.
Mason City, Iowa	1909–10	....	....	1.26	....	2.80	....	....	2.20	
Cincinnati, Ohio	1907–12	$0.95	....	....	2.30	2.25	3.70	2.65	3.45	Boulder, $1.75; Granitoid, $2.10.
Cedar Rapids, Ia.	1912	....	....	.92	1.67	....	....	....	....	
Wayne Co., Mich.	1910	....	$0.25 to .35	.82 to 1.39	....	....	....	....	....	Low cost of gravel road due to low material cost.
Wayne Co., Mich.	1911	....	.52 to .64	1.15 to 1.74	....	....	....	....	....	Dirt or gravel shoulders charged to cost of concrete; width of shoulders about 4 feet.
Trenton, N. J.	1911	....	....	1.44	1.90 to 2.00	....	....	....	....	
LeMars, Iowa	1904	....	....	1.25	....	2.05	....	....	....	Exclusive of grading.

*Average for four or five years prior to 1911.

Estimate of Life of Various Types of Pavements

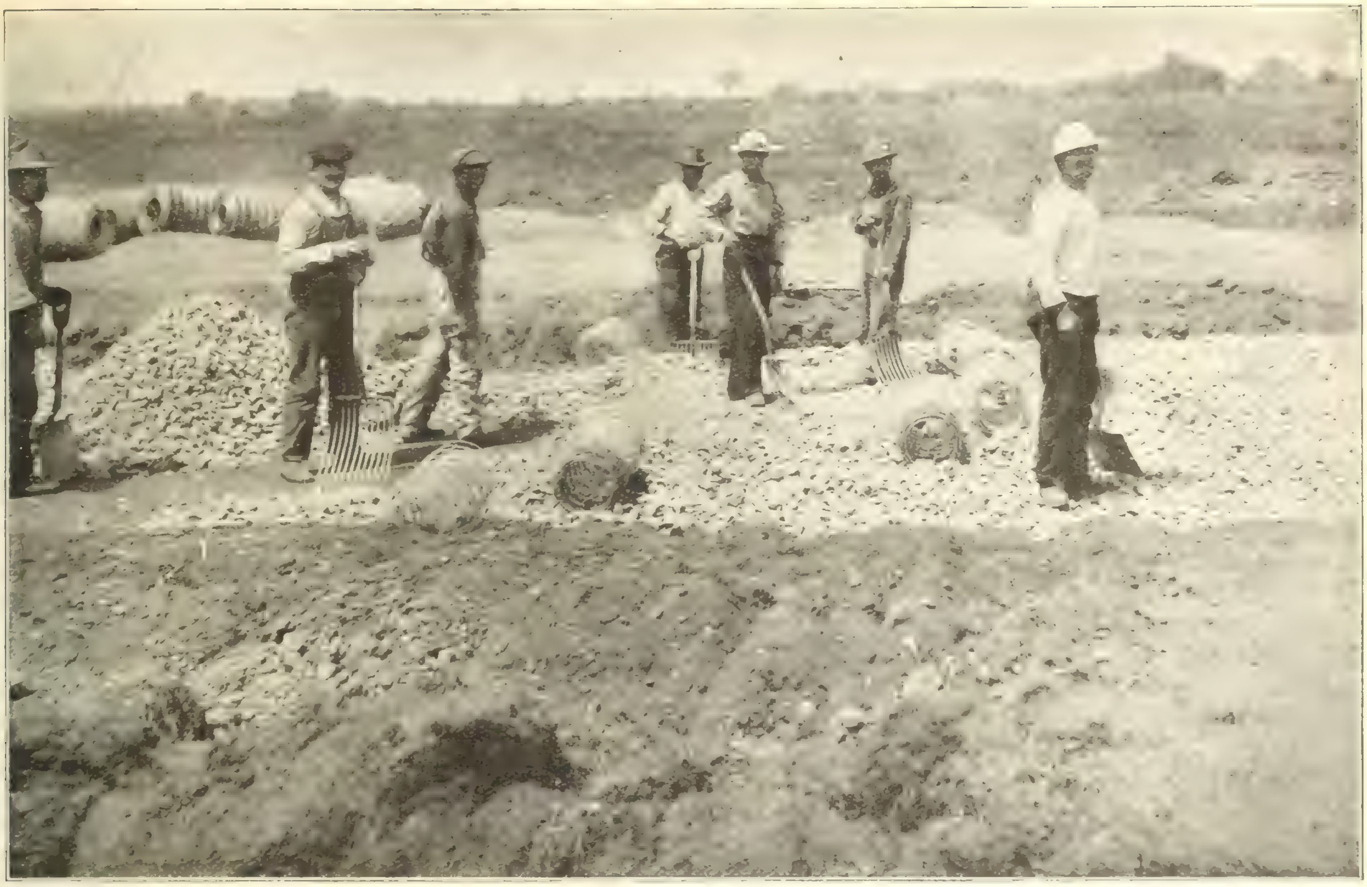
Kind	Life, Years		
	Light Traffic	Medium	Heavy
Cedar Block on 6-in. concrete base	12	9	..
Cedar Block on 9-in. concrete base	..	10	5
Brick on 6-in. concrete base	35	20	10
Brick on 9-in. concrete base	..	25	15
Sheet Asphalt on 6-in. concrete base	15	8	..
Granite on concrete	50	30	15
Macadam—granite top dressing	10	6	..

While it is admitted that such estimates cannot be taken as typical for all localities, they do in a general way show comparative values. On the same basis it is safe to estimate the life of a concrete approximately to be 35 years for light traffic; 25 years for medium traffic and 15 years for heavy traffic. A summing up of the various qualifications of a concrete pavement in comparison with other types unquestionably will lead to the conclusion that under average conditions a concrete pavement comes the nearest to the ideal.

The chief reasons for the use of wire mesh steel reinforcement in the construction of pavements and roadways are the unsatisfactory foundation or subsoil, and expansion and contraction stresses.

The formation of cracks due to the soft yielding subsoil only can be prevented by the use of a proper amount of steel reinforcement. In this case the reinforcement is used to add structural strength to the concrete slabs. Under average conditions the question of expansion and contraction presents the greater number of difficulties. It is now very well known that concrete will contract and expand under changes of temperature and also that the cement during the setting period will contract to a marked degree. This means that the pavement moves over the subsoil, this movement in itself causing the setting up of tension or compression stresses depending upon whether it is a case of contraction or expansion of the material. Although the concrete in itself has a certain amount of tensile value it has been found advisable to eliminate this value in concrete computations. For this reason steel reinforcement is placed in the pavement to take up, or at least assist, the concrete in taking care of the temperature stresses.

In the construction of the two-course pavements, the top or wearing course has a very much richer mixture than the base, and since richer mixtures will expand and contract under temperature changes, and will contract during setting a greater amount than a leaner mixture, there will be formed a plane of weakness between the two courses which often results in the splitting off of the top course from the base. This difficulty is eliminated very readily by the use of a light reinforcement that is slightly tamped into the base prior to the placing of the top course, and thereby increasing the adhesion between the two mixtures. Additional stresses occur because of the fact that especially during hot weather the top or exposed portion of the pavement has a temperature considerably in excess of the under surface. Steel reinforcement also



Long Island Motor Parkway. Reinforced Hassam Pavement. Shows stretching of triangular mesh reinforcement over first layer of broken stone and being covered by second layer of stone.

Reinforced Concrete Pavement, Hamtramck, Mich. 106,000 Square Feet Triangle Mesh Reinforcement.

tends to equalize these stresses due to this variation in temperature.

All engineers agree as to the importance of properly draining the foundations of roadways and pavements and the proper compacting of the subgrade regardless of the type of pavement to be constructed. In general, pavements should not be expected to resist entirely the distortion due to heavy loads, or, in other words, to bridge over the soft places in the subsoil, and for that reason the foundation should be properly drained, especially for soils composed of clay or loam.

All reinforced concrete pavements are constructed of a one or two-course type. The one-course type consists of the same concrete mixture for the entire depth. It received its name from the fact that the entire pavement was originally laid in one course. However, when a reinforcement is used it is necessary to make the construction of two courses, although the mixture for both is the same. This is required in order to place the reinforcement in the proper position in the slab. The two-course type consists of a base of a comparatively lean mixture and a thin wearing course of a rich mixture, the idea being for the base to act as a solid foundation and the top course to resist abrasion from traffic. Some engineers advocate the one-course type and claim it to be cheaper than the two-course work. This statement may or may not be true, depending largely upon local conditions, as it is necessary to use a richer mixture for the entire thickness of the slab than is required for the base of a two-course type. For this reason although the wearing course of a two-course type consists of a rich mixture it may be more economical in some localities than the one course. We believe that, eliminating the question of cost, the two-course pavement is superior, as the material that is used in the top, or wearing course, will be superior to the surface material of the one-course pavement.

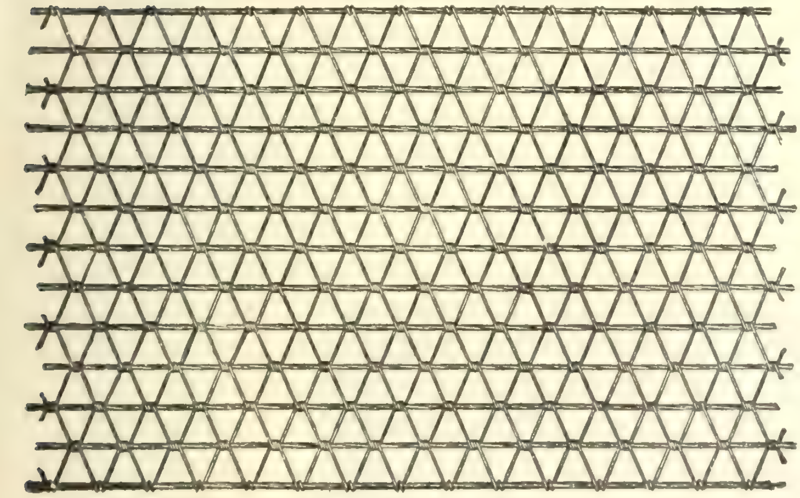
Reinforced Concrete Pavement, Oakland, Cal. **Triangle mesh reinforcement. Pavement laid on filled ground.**

The success or failure of a concrete pavement depends very largely upon the selection and proper mixing of the ingredients. The coarse aggregate should consist of a good, durable crushed stone, or screened gravel, and, since it is advisable to decrease the voids in the stone to a minimum, the more carefully the stone is graded the greater the strength of the finished work. This is also true of the fine aggregate which may be made up of crushed stone screenings, granite preferred, from which all dust has been removed, or from good coarse sharp sand. In all cases the fine and coarse aggregate should be clean and free from all vegetable or other injurious particles.

From examples of pavements now in use it is observed that a number of different concrete mixtures have been specified. In some cases the base of the two-course pavements has been of a 1:2:4 mixture, while in other cases a mixture of 1:3½:6 has been used. Although it is impossible to say definitely without knowing more about the quality of the aggregate used, it can be stated generally that for a two-course type a mixture for the base of one part of cement, 2½ parts of clean sharp sand and 5 parts of crushed stone should give satisfactory results. However, the engineer in charge of the design should determine in each case the proper mixture to use, depending upon the material that will be furnished. His selection should be based not only upon the quality of the material, but also upon the voids which it contains. The cement should over-fill the voids in the fine aggregate by at least ten per cent., and a cement and fine aggregate should overfill the voids in the coarse aggregate by at least ten per cent. A sufficient amount of water should be added so that the fine material will flush to the surface when tamped. In other words, the larger stones should be forced below the surface a sufficient amount to permit of a proper floating and finishing.

The proper thickness for a pavement depends largely upon the amount and kind of traffic it will be required to carry. Although the condition of the foundation and the amount and position of the reinforcement used may require a different thickness it will generally be advisable to make a total thickness of six inches on residential streets and seven inches on business streets, carrying heavy loads. For the two-course type of pavement the wearing course should be at least one and one-half inches thick. These figures are considered good practice, but it should be possible to decrease these quantities by using a sufficient amount of reinforcement.

For reinforcing concrete pavement a woven wire reinforcement is the best that can be used. In order to furnish an economical construction, using loose bars, it would be necessary to space them at a distance which would not give a satisfactory distribution of the steel. Small bars spaced from eighteen to twenty-four inches apart could not possibly give satisfactory results in comparison with a woven wire reinforcement having an equal and close spacing of the members. Triangle mesh wire reinforcement is manufactured from cold drawn wire properly tested to give uniform results. It has a minimum ultimate breaking strength of 85,000 pounds per square inch and consists either of solid or stranded longitudinal members properly spaced by means of diagonal cross wires so arranged as to form a series of triangles between the longitudinal, or tension members. The longitudinal members are invariably spaced four inches apart, the cross wires either two inches or four inches apart, thus providing either a two-inch or four-inch mesh. The sizes of both longitudinals and cross wires are varied in order to provide the cross-sectional areas of steel required to meet the conditions.



4-inch Triangle Mesh Concrete Reinforcement. Showing stranded longitudinals.

Reinforced concrete pavements and roadways have all the desirable features, namely: minimum original cost and maintenance, durability, tractive resistance, foothold, sanitary qualities and favorableness to traffic. These factors have been realized in a number of American cities. A few of these municipalities, with the cost of construction are given below:

City	Cost Per Square Yard
Plymouth, Wis.	$1.235
Sheboygan, Wis.	1.20
Fond du Lac, Wis.	1.325
Superior, Wis.	1.29
Hamtramck, Mich. (Detroit)	1.35
Port Huron, Mich.	1.22
Rockville, Ind.	1.10
Vinton, Ia.	1.07
Connorsville, Ind.	1.02
Stanley, Wis.	1.52
Davenport, Ia.	.93

These cities are selected at random showing the wide range of territory and the costs as to the localities. In some cases the cost given does not include excavation.

To Pave or Not to Pave

To pave, or not to pave; that is the question:
Whether 'tis nobler through life to suffer
The delays and breakdowns of outrageous roads,
Or to take arms against a sea of mudholes,
And by paving, end them? To pave—to pave with brick—
No mud; and with these bricks to say we end
The ruts and the thousand natural ponds
That our roads are heir to—'tis a consummation
Devoutly to be wish'd. To pave—to pave with brick!—
To pave with brick! Perchance to pay! Ay, there's the rub;
For in that tax on highways, what payments may come,
When we have covered o'er these muddy ruts,
Must give us pause. There's the respect
That makes calamity of so many roads;

For who would bear the shock and jar to travel,
The trip's delay, the city man's contumely,
The pangs of lonely life, the markets miss'd,
The loaded wagons broken, and the spurns
That patient farmers of the progressive take,
When he himself might his pavement make
With a few thousand brick? Who would these troubles bear,
To grunt and sweat under a weary life
But that the dread of something after paving,
The unknown tax from whose burden
No tax payer escapes, puzzles the will,
And makes us rather suffer those ills we have
Than fly to others that we know not of?

Thus the cost does make cowards of us all:
And thus the native hue of resolution
Is sicklied o'er with the pale cast of thought,
And pavements of great length and worth
With this regard are left unlaid
And lose the people millions.

—W. D. P. W., in The Clayworker.

Prior to leaving England for Chili, Mr. A. D. Swan, late assistant chief engineer to the Montreal Harbour Board, was entertained at dinner given in his honour by Mr. F. W. Cowie, the chief engineer. The Harbour Commissioners, together with Major G. W. Stephens, Mr. C. C. Ballantyne, and the heads of the various departments and members of the engineering staff were present. Speeches were made appreciative of the work of Mr. Swan during his 4½ years connection with the Commission. Mr. Swan, who will report on a number of harbours on the west coast of South America and Chili for a European firm, will be accompanied by Mr. Sidney Morrisey, of Montreal. Mr. Thomas Harvey has been appointed assistant to Mr. Swan.

Principles of the Bitulithic Pavement

An Outline of Constructional Methods and Main Advantages: Satisfactory in Appearance, Durable, Affords Easy Foothold, Inexpensive in Maintenance

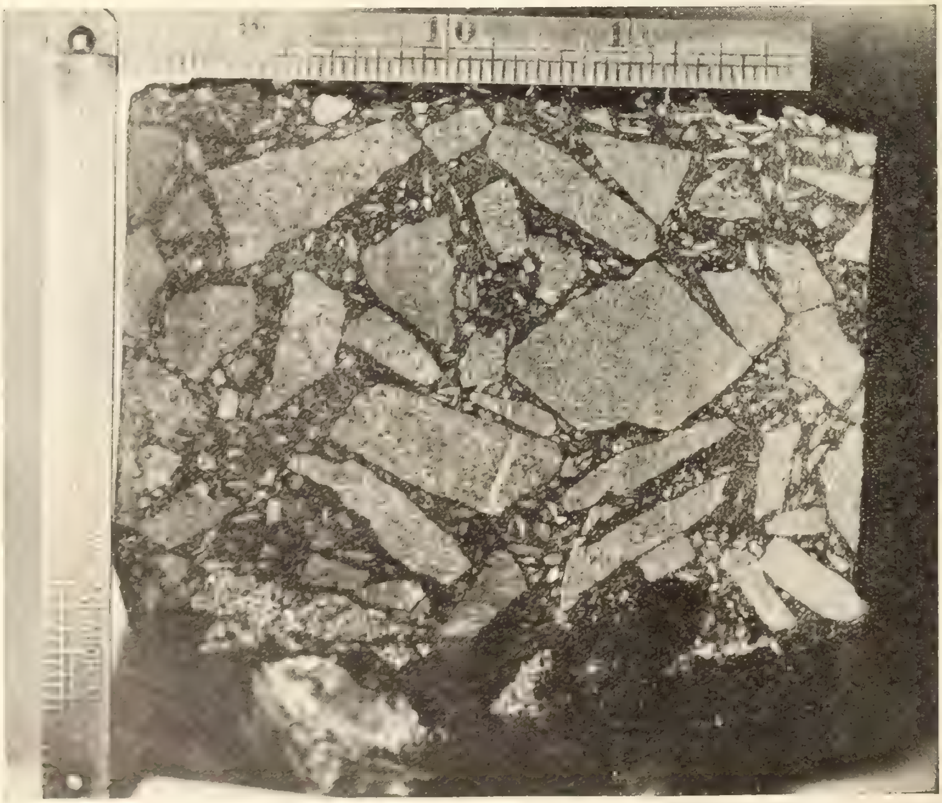
By C. O. Warren

ENGINEERS and city officials are constantly hearing of the Bitulithic Pavement, but it may not be clear to all as to precisely what this pavement is, and what it stands for in the science of street and road building. The word bitulithic is coined from the Latin word, bitumen, and the Greek word lithos, stone. The essential principles of bitulithic are the durability and resistance to destructive traffic and other conditions, which can be secured only through the use of mineral ingredients so combined as to have almost the compactness of solid stone. However, the solid stone would not be suitable because of its lack of resiliency and the absence of elasticity and its tendency to abrade, and thus wear away under the influence of traffic. In bitulithic the desirable, essential elements of stone have been preserved and the weakness eliminated by the combination of various sizes of crushed stone, so mixed as to reduce the voids or interstices to a minimum. These voids are filled with a waterproof elastic cement, which produces the necessary ease of traction and at the same time binds the mineral ingredients together.

The unique feature is the making of an artificial combination of stone and bitumen in such a manner that the resultant mixture has the highest attainable degree of stability, that there are no voids or interstices in the mixture, and that it is therefore absolutely waterproof and consequently very durable. The accompanying photographic reproduction of a sawed vertical cross-section of the bitulithic pavement laid on Dartmouth street, Boston, after eight years use (the pavement is now ten years old) illustrates these points.

Diligent search has not divulged that any effort has ever been made before to reduce the voids in the artificial bituminous mixtures by scientific grading from the maximum to minimum size of the mineral aggregate, or that the principles involved have ever been understood in the art.

The late Frederick J. Warren in his researches decided that the pavement for the future would have to be made of broken stone and bitumen, so as to retain as much as possible the ease of traction of the sheet asphalt pavement and the stability and non-slipperiness of the macadam road. He ascertained that in crushed stone, as separated into commercial sizes, there is approximately 45 per cent. of voids and in the mineral aggregate of a macadam roadway, laid as is customary in various layers of stone, each layer containing stone of approximately one size, that the



Sawed cross section of bitulithic pavement laid on Dartmouth St., Boston, 1903. Sample batsen 1911. Pavement now 10 years old. Shows stone construction and dense mixture.

percentage of voids, even after rolling, was approximately 30 per cent. and that while a macadam road could be rolled until it was hard and solid, it could never be made waterproof on account of the great number of voids in the mineral aggregate, which accounted in a great measure for this character of road breaking up under moderately heavy traffic or under the action of the elements. He found also that the best sands as used for asphalt pavements contained from 30 to 35 per cent. of voids and that even with care in mixing and grading the sands it was not possible to reduce the voids below 25 per cent., and as it has never been expedient to incorporate in an asphaltic mixture more than ten or eleven per cent. of asphaltic cement else the pavement would be too soft, these pavements are all more or less porous, hence do not wear well.

Mr. Warren further found that by separating his stone into different sizes, ranging from the maximum size to be used down to an impalpable powder, he could bring the same stone together again in such proportions and that the resultant voids would be less than 10 per cent. and by so doing he gained greatly in inherent stability.

By reducing the voids to this low percentage he was able to add enough bituminous cement to completely fill all voids and obtain a mixture absolutely dense and of great stability.

The asphalt pavements depend entirely upon the cementing quality of the asphalt for their structural strength. There is no strength or stability in the sand that is used as the mineral aggregate in this form of pavement. Consequently the asphalt cement must be prepared with great care, so that the mixture will not be soft enough to give way under the heat of the sun or under traffic, or hard enough to crack under the severe changes of the winter weather.

In the bitulithic pavement the stability is in the dense and closely compacted mineral aggregate which enables the use of a much softer bituminous cement than has ever before been possible or practical in road building. The softer bituminous cements are more adhesive and more cohesive, and consequently have much greater cementitious qualities. They have greater life and they also prevent the cracking of the pavements. Many of the asphalt pavements are full of unsightly cracks, especially after they have been in use a few years, while in the many hundreds of miles of bitulithic pavement that have been laid on this continent, a crack is almost unheard of.

In the construction of the bitulithic pavement the first step is to secure stone which is adapted to produce the best results. Careful inspection and laboratory tests are made to ascertain the porosity and friability of the stone and what proportions of the varying sizes can be used to give that resistance known as inherent stability of the mixture. To the mineral ingredients in the predetermined proportions is added the bituminous waterproof cement in sufficient quantities to entirely fill the remaining voids.

The resulting mixture combined and well heated to the proper temperature is hauled to the streets and there, after careful laying to uniform grade, is thoroughly compacted under rollers with sufficient weight to force the component units closely together

Bitulithic pavement on University St., Montreal. 11% grade.

The bitulithic pavement presents a pleasing appearance to the eye, affords an easy foothold to traffic, and is as durable as any form of street construction exposed to the wear and tear of constant use. Bitulithic is not a cheap pavement, but its first cost is reasonable when quality is considered. Because of their low cost of maintenance bitulithic pavements have been in use for nine or ten years without repairs and need no repairs today. The ultimate cost of maintenance of bitulithic over a period of years compares favorably with the cost of all other forms of pavement.

According to such experts on road construction as Tillson and Baker, bitulithic contains in largest amount the essential qualities and most nearly approaches in reality the ideal pavement. "Municipal Engineering" is authority for the following table showing the comparative merits of asphalt, brick and bitulithic, with the ideal pavement based on standards from the authorities indicated.

Street Pavements and Paving Materials, By Geo. W. Tillson

	Ideal	Asphalt	Brick	Wood Block	Bitulithic
Cheapness	14	4	3		4
Durability	21	15	13		16
Easiness of cleaning	15	15	12		15
Light resistance of traffic	15	15	12		15
Non-slipperiness	7	4	6		7
Ease of maintenance	10	6	6		7
Favorableness to travel	5	5	4		5
Sanitariness	13	12	11		13
	100	76	67		82

St. Joseph St., Lachine. Paved with bitulithic.

"Roads and Pavements," By Ira O. Baker

Low first cost	15	6	8	8	8
Low cost of maintenance .	20	16	14	12	18
[illegible] of traction	10	10	8	7	10
Good foothold	5	2	4	1	5
[illegible]	10	10	9	9	10
	60	44	44	37	51

"Engineering Work in Town and Small Cities" (standard work by Earnst McCullough, formerly Consulting Engineer for the Merchants' Association of San Francisco) contains the following comments: —"The writer wishes to go upon record as saying that with honest workmanship and honest materials the bitulithic pavement in his opinion has a larger percent. of the desirable qualities than any other material with which he is acquainted. It approaches very nearly the ideal pavement."

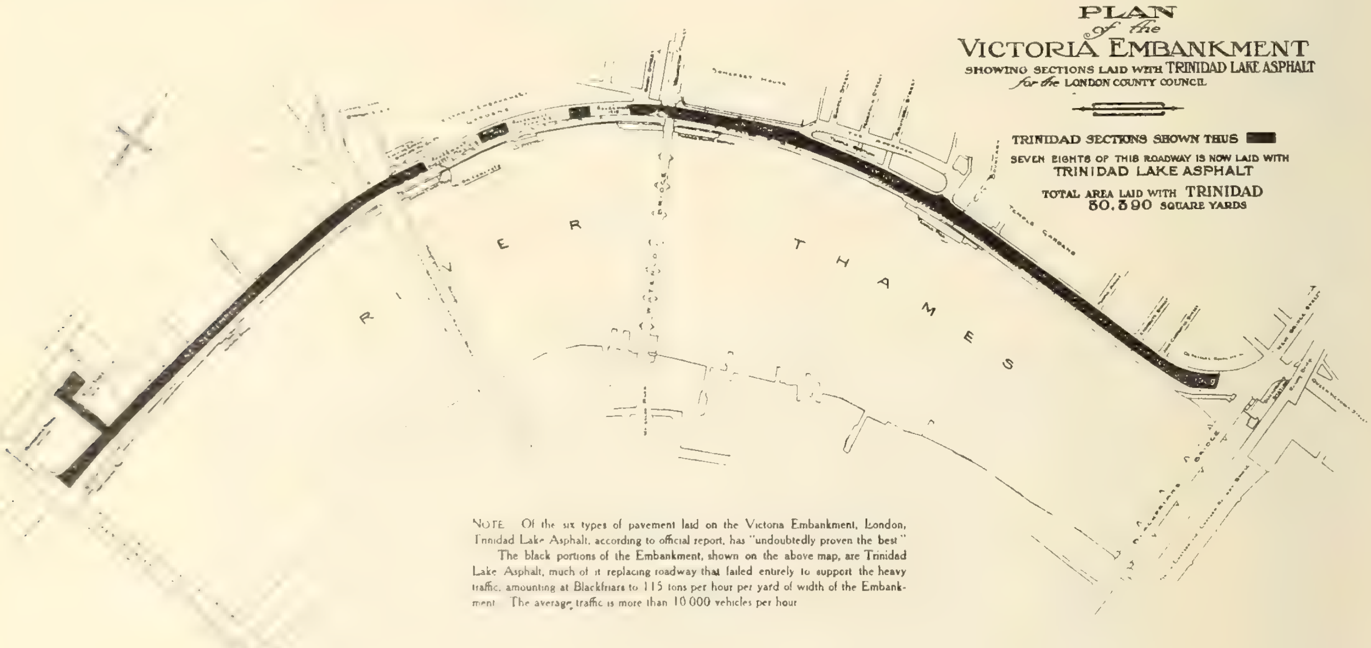
Asphalt in Highway Construction

By Professor Clifford Richardson

THE use of asphaltic material in the construction of pavements was the result of an accident. It was noticed in 1849 that pieces of the bituminous rocks from the Val de Travers mines in France, which dropped from the carts along the road in hauling the material from the mines to the factory were consolidated under traffic and the sun's heat, and made a desirable surface. A road constructed of this material then met with some success, and in 1854 a street in Paris was paved with the rock asphalt which had been ground and compressed upon a concrete foundation. It was so satisfactory that by 1878, 13 miles of it had been laid. In 1869 and 1870 similar pavements were constructed in London, and its use spread until about 14 miles had been laid in that city on streets of heavy travel.

E. J. De Smedt, a Belgian chemist, had observed the rock asphalt pavements of Paris before coming to the United States and with a view to introducing a pavement of a similar type in this country and avoiding the heavy cost of bringing the rock asphalt to the United States, conceived the idea of making an artificial mixture of sand, powdered limestone and a cementing material of the asphalt available at that time and coming from the Island of Trinidad, after bringing it to the proper consistency with a heavy petroleum residual oil. He laid a surface of this composition in 1870 in front of the City Hall in Newark, N.J., and in 1873 on Fifth avenue, New York City, opposite the Worth Monument, and other samples at various points. These surfaces gave such satisfaction that the Commission appointed by Congress in 1876 to pave Pennsylvania avenue in Washington, D.C., selected this form of surface for a portion of the work, 54,000 square yards, the remainder being paved with rock asphalt. The mixture laid under DeSmedt's direction was a success, and so much more so than the surface constructed with the foreign rock asphalt, that no more of the latter was laid in that city, while the area of Trinidad sheet asphalt pavements grew very rapidly, and its use extended to many other cities in the United States. At the end of the year 1883 it had been laid in ten cities, Washington, Buffalo, Omaha, St. Louis, Philadelphia, Louisville, Baltimore, Boston, Youngstown, Ohio and Erie, Pa. Ten years later the entire area of Trinidad sheet asphalt surfaces amounted to 14,000,000 square yards, and the number of cities in which it had been exploited had increased seven-fold. The sheet asphalt paving industry had now been placed upon a well-established basis, which involved the importation into the United States of from 85,000 to 95,000 tons of crude Trinidad Lake asphalt annually. At that time another form of asphalt from a deposit in Venezuela, known as Bermudez Lake asphalt, was introduced, and has since played an important role in the industry.

The construction of this vast area of asphalt pavements had been carried out largely on an empirical


PLAN of the VICTORIA EMBANKMENT
SHOWING SECTIONS LAID WITH TRINIDAD LAKE ASPHALT for the LONDON COUNTY COUNCIL
TRINIDAD SECTIONS SHOWN THUS ▬
SEVEN EIGHTS OF THIS ROADWAY IS NOW LAID WITH TRINIDAD LAKE ASPHALT
TOTAL AREA LAID WITH TRINIDAD 50,390 SQUARE YARDS
R I V E R T H A M E S

NOTE. Of the six types of pavement laid on the Victoria Embankment, London, Trinidad Lake Asphalt, according to official report, has "undoubtedly proven the best." The black portions of the Embankment, shown on the above map, are Trinidad Lake Asphalt, much of it replacing roadway that failed entirely to support the heavy traffic, amounting at Blackfriars to 115 tons per hour per yard of width of the Embankment. The average traffic is more than 10,000 vehicles per hour.

basis. The surface mixture was made from sand available locally, more or less ground limestone, and with variable amounts of asphalt cement which was of no standard consistency. In attempting to construct surfaces which were to withstand the heaviest traffic of our larger cities, it was realized that some more rational system must be devised to meet such conditions. Experts had observed that some of the surfaces which had been laid during the previous 18 years, were more satisfactory than others, and an examination and study of the mixtures which were most durable showed that this was to be attributed to the use of sand of a particular character, the employment of a large amount of filler, and of asphalt cement of a more definite consistency than had been heretofore employed. Investigations extending over the years, 1894, 1895 and 1896 made it possible to put the sheet asphalt paving business on a rational basis, so that successful work could be depended upon in every locality where asphalt paving surfaces laid in the earlier years of the industry which had been particularly successful, such as that laid in 1879 with Trinidad Lake asphalt on Vermont avenue in Washington, D.C., opposite the Arlington Hotel, which has proved most satisfactory, and which is still in existence in an equally satisfactory condition after 34 years use, and with a maintenance cost of less than ten cents per square yard during the first 31 years of its existence. Since 1896 many surfaces have been constructed on the principles then laid down which have demonstrated most successfully the durability of this type of construction under the most trying conditions. In 1896-7 a Trinidad Lake asphalt pavement was laid on Fifth avenue, between 9th and 59th street in New York, upon a concrete foundation, which has withstood the very heavy travel found on that important thoroughfare for 16 years with entire satisfaction, and with only a moderate cost for maintenance.

Sheet asphalt surfaces constructed on similar lines were laid in many other cities of the United States, under similar or even more trying conditions, such as some of the business streets of Chicago and other cities which were equally successful. By 1903 sheet asphalt pavements were in existence in over 200 different municipalities in the United States, to the extent of about 38,000,000 square yards, constructed by a number of different companies. During the same period similar pavements were constructed in South America, in England, Scotland and France which have been entirely satisfactory.

One of the most successful pavements of this kind has been laid on the Victoria Embankment in London, England, the first demonstration of which was made in 1906. The first work which was done in that locality was in competition with many other forms of surface which were tried out there to discover some form of construction which would resist the very heavy travel of that roadway. The Trinidad asphalt pavement was the only one, which after some years trial, met the conditions there imposed, and by far the largest part of the Embankment has since been paved with this type of surface, replacing others which have failed. A similar success was met with on a smaller scale in Paris, France, and important pieces of work of this kind have demonstrated that sheet asphalt surfaces, when carefully constructed, satisfactorily meet the most trying conditions to which they are exposed, such as very heavy travel and unfavorable climatic conditions.

In view of the success of work of the type which has been described, the expansion of the industry has been enormous during the last decade, notwithstanding the competition of other forms of construction, and the area of sheet asphalt surface at the present time is estimated to be not less than 300,000,000 square yards. Its future success is assured.

Sheet asphalt pavements are desirable for many reasons, among which may be cited;

(1) It is a smooth surface which reduces the tractive effort to haul vehicles over it to 1-3 to 1-5 of that over the various forms of stone pavement, and reduces it to a point comparing favorably with any form of smooth pavement. It thus increases the tractive power of horses and, in addition, saves the repairs to vehicles due to the wear and tear resulting from the incessant blows of the rougher surfaces.

(2) Sheet asphalt pavements have been shown to be, when carefully constructed, the most durable type of smooth surfaces, as illustrated by the long life of Fifth avenue, New York, where the number of vehicles using the surface has reached as high as 12,000 in ten hours, while some of the Trinidad Lake sheet asphalt surfaces have been in existence with satisfactory results, as has been said, for 34 years.

Fifth Avenue, an asphalt-paved thoroughfare subjected to heavy traffic conditions.

(3) From a sanitary point of view a sheet asphalt surface is more desirable than any other form, since it has no joints and can be cleaned readily and much more cheaply than any other form of surface.

(4) It is a safe form of smooth surface as far, as horse traction is concerned, and is less slippery than surfaces of wood-block. Observations have shown that the number of falls of horses on an asphalt surface is less than on those of stone, rock asphalt or wood-block.

(5) It is a comparatively noiseless pavement and thus contributes largely towards reducing the intolerable nuisance of this kind originating in many other forms of surface.

(6) A sheet asphalt surface can be laid at a [illegible]

cost, even when constructed in a most satisfactory manner, than stone blocks, brick or wood, and its maintenance has been shown to be, when properly constructed, very moderate.

With the introduction of the motor vehicle it has been found that some bituminous material must be used to bind together the surface of our main highways, in order to enable them to resist the destructive action which they occasion. The water-bound macadam road is a thing of the past as far as being able to resist the concentrated motor travel is concerned. For this purpose the native asphalts, such as those from the Trinidad and Bermudez deposits, have been found to be more successful than any other available material. Highway surfaces constructed with broken stone and these bitumens have met the conditions imposed by motor vehicle traffic most successfully, for a number of years, when carefully constructed, in Massachusetts, New York and elsewhere. The native asphalts have, undoubtedly, a very large field for use in this direction, and their value is being demonstrated with the lapse of years in a most striking manner.

The Scientific Method of Laying Concrete

(Contributed)

THE so-called Hassam Pavement, in its present form is the perfected result of many experiments made by W. E. Hassam, while he was Superintendent of Streets of Worcester, Mass. It was found in practice that ordinary mixed concrete used as a foundation for brick or stone block pavements failed to meet all the requirements. For example, it was difficult to obtain a perfectly uniform surface on which to place brick or stone blocks and have it at the same time of uniform density or with a uniform distribution of ingredients. When the concrete is laid for foundations of piers or buildings and the mass is of great depth, this fact is not of great importance, but when only a thin layer on the subgrade of a road or street is required, it becomes of serious moment. Owing to the different specific gravity of the various material composing the concrete mass, there will be a separation of the parts before the cement is set. This is observed when a batch of concrete is transported either in a wheelbarrow or cart. The shaking of the mass, even when run over a good roadway or plank, settles the mineral aggregate to the bottom and leaves the cement mortar on top. The dumpings of a barrow or cart-load still further disturb the relation between them. Each load that is dumped is more or less different from all others and there is greater density in some portions of each load than in others, so that as a matter of fact it will be found on examination of concrete laid on the subgrade of a road or street that masses of stone with comparatively small amount of cement and sand will result and in others cement and sand and very little rock. In short, no two adjoining sections will have the same amount of specified ingredients. This condition is but little helped by ramming or tamping. The practical result is that two unsatisfactory conditions are manifest: the surface of the cement foundation is uneven, and the sustaining strength of the concrete is never the same in all parts of the road. These conditions lead to a series of experiments in order to obtain for stone block, brick or wood block pavement an even foundation of uniform strength which would secure a smooth final surface and one which would hold its shape indefinitely. It was found after many trials that the most satisfactory if not the only way to obtain all the necessary characteristics for such a base was as follows: broken stone sufficiently tough to withstand the weight of a 10-ton roller when run over it enough to thoroughly compact it is placed upon a properly prepared subgrade and rolled until thoroughly compacted. This stone should be of cubical form and not less than two inches in its largest dimensions and should be so carefully placed that after rolling it presents a perfectly uniform cross-section, rough because of the large size of the individual stones, but uniform in shape both longitudinally and laterally. The voids between the stones are thus reduced to a minimum. A cement grout, composed of one part hydraulic cement to two or more parts of sand and of sufficient water to secure an easy flow, is then distributed evenly over the stone. This can best be done by a grouting machine invented for the purpose.

Before the grout has begun to set the whole is thoroughly rolled again. This is done to force the grout into every void and to drive out any air, making the whole a monolith. This process compresses the concrete from 15 to 25 per cent. as compared with ordinary mixed and tamped concrete. In other words, the same amount of material will occupy from 15 to 25 per cent. less space; moreover, every square yard of surface will have exactly the same amount of stone under it with a uniform amount of cement and sand. Any pavement laid in such a foundation never gets out of surface, except by the wearing away of the surface itself. Depressions in the road never appear by reason of settlement or lack of uniformity of the foundation, and all parts are of equal strength. Careful comparative tests of the above method and ordinary tamped or rammed concrete of identical composition were made under the direction of the Worcester School of Technology. These tests show about fifty per cent. greater crushing strength in favor of the Hassam process.

The foundations laid as described were found to be so uniform in shape and so indestructible in character that where traffic was not too severe, it was adopted as a completed road and many hundreds of thousands of yards have been so laid with entire satisfaction, the only criticism possible being that surface cracks appear unless great care is taken to protect the top until it is well set. Such cracks do not reduce the strength of the road, but they are unsightly and sometimes chip on the edges. So-called expansion joints will not prevent the occurrence of such cracks, because the cracks are the result of contraction and not expansion. This is the difference between the foundation already described and the same method used as a finished road, viz., that the distribution of the grout should be so made that the actual wear of wheels and horses' feet should come upon the stone and not on

Columbia Street, New Westminster, B.C.

Road construction by the H [illegible]

Second Avenue, Vancouver, B.C.

Long Island Motor Parkway. Continuous Hassam pavement for 36-3 miles.

the grount. This can be done by brushing with wire or other coarse broom before the cement is set, the brushing to be done from side to side and not longitudinally. A smoother top can be obtained, of course, by flushing the surface with a richer grout. A road built in this way is, of course, somewhat dusty, and more or less noisy. It is also rigid and hard on horses' feet, but not slippery.

In order to overcome these objections experiments were made in using tar or other bituminous compound to cover the surface. These experiments began as long ago as 1906 with ordinary gas house tar, put on with pails and brooms. It was found that this tar so applied was stripped off and at the end of a year of fairly heavy and varied traffic most of it had disappeared. Since then many trials have been made and as a result it is believed that the following produces the best road surface. The concrete road made as outlined must be thoroughly cleaned and washed if possible, so that no dirt or foreign matter remains in it. While the surface is still slightly damp, a coal gas or water gas tar refined but with some of the volatile oils still remaining should be applied to the surface by means of a machine that will force it on the road under pressure of 70 to 80 pounds to the square inch with the nozzles of the machine within six inches of the road. This application should not exceed ¼ gallon to the square yard. Immediately after this application is made it should be covered evenly with stone chips and rolled with a light steam roller. After brooming off the loose chips another application should be made of heavier tar or preferably asphalt also under pressure and a little more in quantity (from ¼ gal. to ⅜ gal). This layer also should be covered immediately with stone chips or coarse sand and again rolled. The advantage of such a road is this, that it combines durability with economy.

General view of British Columbia Parliament Buildings at Victoria, B C. showing Hassam pavement in driveways.

Protection of Buildings from Lightning

A paper read by Mr. Ernest J. Berg before the Illinois State Electric Association contains some useful practical conclusions with regard to the protection of buildings from lightning by means of rods. Attention is drawn to the fact that, while the damage done by lightning to buildings situated in the country is considerable, the damage done by lightning in cities is relatively small. It has been found that the extensive network of overhead wires in towns, and the grounded steelwork in the modern building, afford ample protection, and it further appears that the modern skyscraper with its vast amount of steel may be considered lightning proof.

While experience has shown beyond reasonable doubt that properly installed lightning rods afford considerable protection, it does not seem to be possible to protect any building to such a degree that absolute safety can be guaranteed. Such safety apparently exists only in the case of an all-metal building. However, that the protection afforded is valuable is shown in the case of certain buildings situated in exposed positions which formerly suffered considerable damage at different times, and which have not been struck during an extended period of time after the installation of lightning rods. Again, there is a danger to be considered in the careless use of the lightning rod, inasmuch as a rod improperly arranged, broken, having poor joints, or a high resistance to ground, may make matters worse instead of better.

The rod should have good joints, good ground connection, and should be mechanically secure against breaking, although its shape, metal and general dimensions are comparatively immaterial. The more rods used the better the protection afforded will be. The protection afforded may be said to be roughly proportioned to the number of earthed rods. For instance, for a house measuring in plan 100 feet by 50 feet, half a dozen rods would not be too many, or anything unusual in good practice. These rods should be placed outside the building, and it is a question whether the rod proper should not be fixed at some distance from the wall or insulated therefrom. The rods should be kept far away from gas pipes, stove pipes, water pipes, balconies or places where persons might be during a storm. The rods may be advantageously connected, say, along the ridge of the roof, but separate branches which are not grounded are sources of danger. Heated gases coming from chimneys or shafts are themselves conductors, and it is therefore well to have a metal conductor crossing such openings. Such a conductor should be of copper rather than of iron in order to withstand the action of corrosive fumes. Each tower or projection of a building should have its separate grounded rod, which should be connected to the other rods in the system. It is sufficient if these rods project a few feet above the top of the tower. To be effective the rods should have several points.

Metal gutters should be connected to the lightning rod system, and should be connected to the ground at the lower end. High shafts need two or three rods, and the opening of the chimney should be covered by some simple copper rod construction. Copper rods are required in cities where they are likely to be attacked by corrosive gases, but the author sees no electrical advantage in having a stranded cable; a solid rod is as efficient. There is a very slight advantage in a flat ribbon, but this advantage is very small, and the mechanical difficulties with a ribbon are greater than with a rod.

Galvanized-iron rods are recommended where the corrosive gases present in the air of cities have not to be reckoned with. Galvanized iron is cheaper, and its electrical constants are, if anything, better than those of copper. "The old idea that the rod carries the electric charge to earth, and that that is the end of it is fallacious. The earth is one plate of the condenser, the cloud the other, and whatever energy is stored between them has to be consumed in some way. It is done by heating the rod and by sending out electric radiations. The higher the resistance of the rod the greater is the energy converted to heat, and thus the smaller number of oscillations of the discharge current necessary to dissipate the energy. Iron has considerably higher effective resistance than copper, and thus has an advantage."

Rods should be terminated preferably in moist soil. Salting the ground may be an advantage, but experience on this point is not sufficient to warrant its adoption, unless an occasional inspection is made. In many cases an excellent connection to earth can be made by driving a galvanized-iron gas pipe a few feet into the ground. It is doubtful whether steam or gas pipes should be connected to the rods when grounded. On the whole it seems best to leave them alone, especially the gas pipes. The water pipes, which are always grounded, may, however, be advantageously connected to the lightning rod system underground. We are also warned against the danger of standing in a draught during a storm, and advised that it is safer to keep the house closed during violent storms.

The Mount Royal Tunnel of the Canadian Northern Railway

By J.L. Busfield, B.Sc., A.C.G.I.

THE Canadian Northern Railway and its allied companies will shortly become a great transcontinental system, and in order to connect this system with suitable terminal facilities in the heart of the city of Montreal, Messrs. Mackenzie, Mann & Company, Limited, have under construction for the Canadian Northern Montreal Tunnel and Terminal Company a twin tunnel three and a quarter miles long through the highest part of Mount Royal, situated on the north-west side of the city.

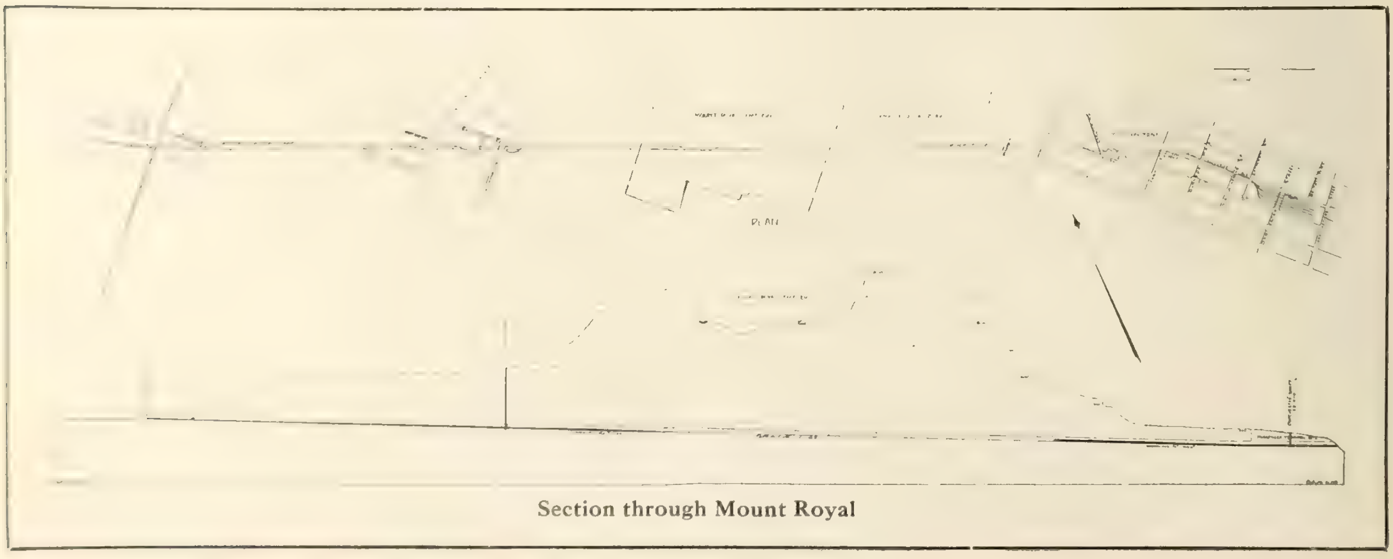
In the construction of this tunnel there are now two working headings, one being driven west from the Dorchester street shaft, called Working No. 1 West, and another being driven east from the Maplewood avenue (Outremont) Shaft, called Working No. 3 East. The location of these workings is generally shown on the plan and profile of the work in Fig. 1.

At the Dorchester shaft the work was commenced in the month of August, 1912. The shaft was made twenty-three feet long by twelve feet wide, the upper part being in soft ground and the lower in Trenton limestone. A bottom heading was driven from the shaft in a westerly direction and has advanced 3,500 feet. This heading is twelve feet wide by eight feet high, being equivalent to about 3½ cubic yards of solid excavation per cubic foot. A large portion of this is in bad ground, both earth and rock, requiring timber. In this heading four 2-¾in. drills are used mounted on a 4 in. horizontal bar (Fig. 2). No drill carriage is used.

At the Maplewood shaft, situated about a mile from the west portal (Fig. 1) the work was commenced in the latter part of July, 1912. A shaft twenty-three feet long by twelve feet wide was sunk through bad ground, after which this was reduced to sixteen feet by ten feet for the remaining portion, making a total depth of two hundred and forty feet. Trenton limestone was encountered near the surface and the shaft was sunk at the rate of from five to eight feet a day. The muck was taken out in large skips, which were tipped onto wagons, the muck being hauled away to neighboring dumps.

The centre line of the shaft being about thirty feet south of the centre line of the tunnel, entry gangways had to be driven at the bottom to bring the headings to the tunnel line. The main headings were then driven east and west directly along the line of the tunnel, making a continuous heading past the shaft. Heading No. 3 East has been driven about 2,500 feet through crystalline, Trenton limestone and Essexite cut by dykes of Nephaline Syenite and other igneous intrusions. In this heading, owing to the hard rock, heavier drill bars and drills are used than in No. 1 West, the bar being 5 inches in diameter and the drills having 3-⅝ in. diameter cylinders. The drilling equipment is carried by a drill carriage having a 20-foot cantilever arm with adjustment in three directions. This carriage has also a muck conveyor belt for loading the cars.

Headings No. 3 West and 4 East between the Maplewood shaft and the west portal were holed through on April 5th, thus giving a continuous head-



Section through Mount Royal

ing over a mile and one half in length. It is interesting to note in this connection that the engineers' lines going west from the shaft met those coming east from the west portal within about 1-16 of an inch in line and ¼ inch in grade. The Heading 4 East had soft ground for about 400 feet, after which it was in Trenton limestone and an extremely hard and broken volcanic Breccia.

The full-sized tunnel section is developed at intervals, in so-called break-ups, so that as many working places may be opened up as are required to keep pace with the heading progress. In making this enlarged section the break-up is commenced by shooting down the roof; then "jumbo" timbers are set across the heading, making a temporary floor from which the muck, blown out from the upper level can be easily run into the muck cars below.

An interesting feature of the undertaking is the alignment work. In the first instance precise surveys had to be made around the mountain connecting the various workings so that their correct relation could be determined. At the same time precise levels were taken and the grade for the tunnel fixed. A line was also run over the mountain in the same vertical plane as the tunnel and connected with the surveys and tunnel lines at both ends of the work. At both the Dorchester and Maplewood shafts the engineer's line was transferred to the heading by setting two No. 8 piano wires at opposite sides of the shaft accurately on line with a transit. These wires were hung down the shaft with 30 lb. weights suspended at their lower ends in buckets of water to reduce the oscillation to a minimum. When the wires had been set on line at the surface a second transit at the bottom of the shaft was "bucked" into line so that its cross hairs bisected the two wires. This line was then thrown ahead as far as could be seen. At the foresight station a brass scale was fixed, having a sliding vernier with a plumb bob hanging from the centre of it in front of an illuminated screen. This plumb bob was set time after time by the transitman and an average of the vernier readings taken for the final correct line.

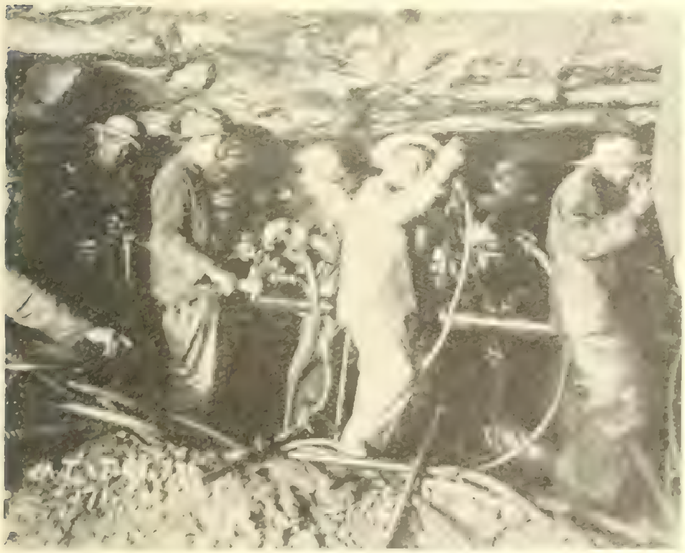


Fig. 2—Drilling gang, with horizontal drill bar and 4 drills in position.

The actual line and grade for the working face are given by setting "spads" in the tunnel roof on the engineer's line [illegible] feet. After they are set the foreman takes his line from them by eye, marking the centre line on the face ahead of the drill bar. Similarly the elevation of the spads are given, and by taking their heights above sub-grade the foreman is able to set the drill bar to the right height. The spads are only a temporary means of transferring the line to the working face. The engineer's line is maintained by making permanent monuments in the floor of the heading every five or six hundred feet by cementing a 1-inch pipe about 2 ft long into the solid rock. At the top of the pipe a piece of brass is firmly riveted and the engineer's line carefully marked on it with a knife scratch or fine punch mark.

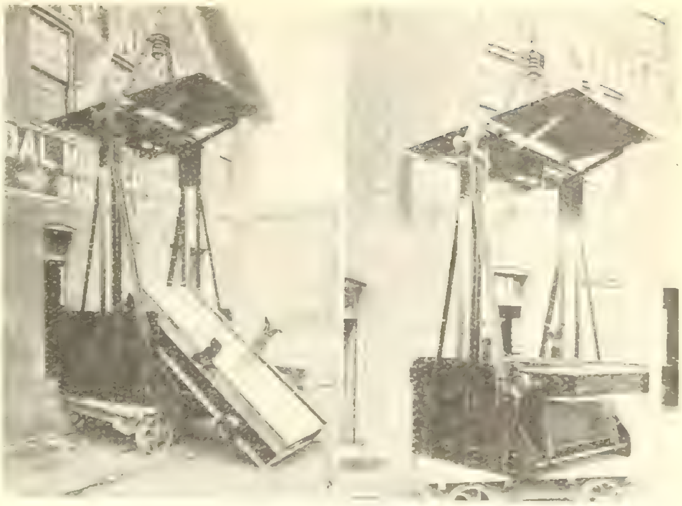


Fig. 3—Self-dumping cage, in dumping and hoisting positions.

The gangs of men work in three shifts of eight hours each, only stopping on Sundays. Each heading gang consists of about twenty men, made up of heading boss, mucking boss, drill runners, helpers, muckers and timbermen.

After blasting, the gang clears out the face as quickly as possible so that the drills can be put into place. While the drilling is going on the mucking gang shovel the muck off slick sheets into the cars. These cars run on a 3 ft. gauge track and have a height of 3 feet 4 inches and a capacity of a little over a cubic yard. When filled they are hauled away by electric storage battery locomotives. At workings Nos. 1-W. and 3-E. these locomotives take the cars direct to the shaft, but at the break-ups they are used to make up the cars into trains which are hauled out to the west portal by trolley locomotives of much larger capacity. At the shafts automatic self-dumping cages are used, shown in Fig. 3. The cages are operated by an electric hoisting engine and the cars are dumped into

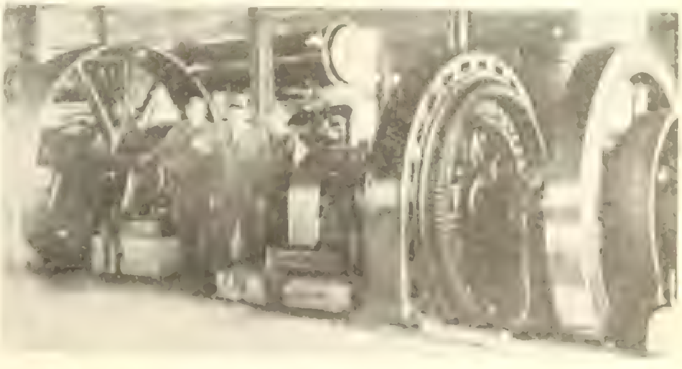


Fig. 4—Compressor plants. Direct-connected compressor on right; belt-driven compressor on left

trains of auto side dumping cars which are hauled out to the muck pile.

Ventilation is obtained in the headings by means of electrically-operated blowers at the surface, which pump fresh air through 10-inch galvanized iron pipes to the different workings. The exhaust air from the drills also gives a material aid to ventilation. The temperature in the heading keeps very uniformly about 55° even in the coldest days of winter.

A very complete construction plant has been installed at each end of the tunnel, each consisting of compressor house, machine shop, carpenters' shop, blacksmith shop, and other smaller buildings for sundry purposes. Each compressor house has equipment capable of delivering 5,300 cu. ft. of free air per minute at a pressure of 100 lbs. per square inch, and comprising four units, namely one direct-connected Sullivan two-stage compressor and three belt-driven Blaidsell cross-compound machines. The former of these machines is driven by a Canadian General Electric synchronous motor, developing 400 h.p. at a normal speed of 185 r.p.m. The latter machines are belt-driven by 225 h.p. 3-phase motors at a speed of 150 r.p.m. All these compressors are fitted with unloading valves which cut off the air supply at a pre-determined pressure in the receiver, thus compensating for the fluctuation in the quantity of air being drawn off by the drills.

At the west portal a complete stone-crushing plant has been erected immediately west of the portal. The cars from the tunnel are run out to the foot of an inclined plane, up which they are hauled by a cable attached to a "dumby" running on a second track of narrower gauge, which is depressed below the main track at the foot of the incline so that cars can be pushed over the dumby by the locomotive.

At the top of the incline the muck can be toppled into the hopper for the crusher on one side or to the dump cars on the other. The muck cars, after being unloaded, continue in the same direction by gravity to a switch-back which sends them back on a separate trestle to the ground level.

The crusher is of the gyratory pattern and has a capacity of 1,500 tons a day. The crushed rock is taken by a bucket elevator to the top of the plant and passed through screens into the different bins or to the stock pile as may be required.

All rock at both ends of the mountain is being crushed for construction purposes. What the company does not use itself is being sold, principally in Montreal, for massive and reinforced concrete as it makes a peculiarly good sharp stone and rather loose in lime.

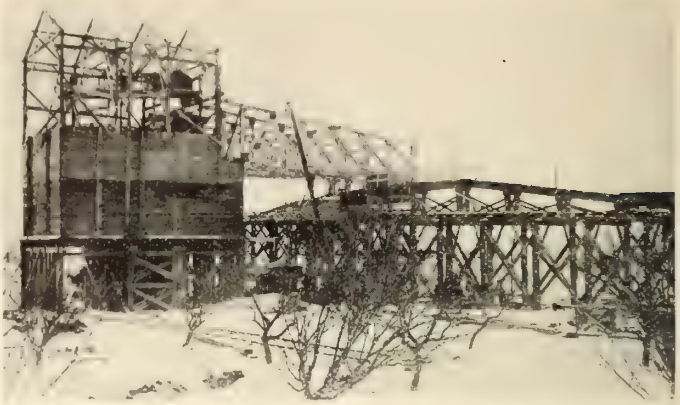


Fig. 5—Crusher plant at West Portal under construction.

The heading progress in the harder rock with drill carriage is about 20 feet a day. At the other end, in the ordinary limestone, it averages about 25 feet a day.

The job organization, covering both design and construction, consists of Richard Byers, general superintendent, west; Edward Duffy, general superintendent, east; W. C. Lancaster, electrical and mechanical engineer; H. D. Robinson, designing engineer; H. T. Fisher, tunnel engineer; J. C. K. Stuart, principal assistant engineer; S. P. Brown, managing engineer for Mackenzie, Mann & Company, Limited, and chief engineer of The Canadian Northern Montreal Tunnel and Terminal Company, Limited; Ralph S. Bassett, chief of party, west, and the writer, chief of party, east.

The railway committee of the commons recently approved a bill to incorporate a new western railway, to be known as the Canadian Northwestern Railway Company. The directors include Lord Howard de Walden, Lord Clinton and Lord Montague of Beaulieu; W. F. Morgan, Jr., of Paris and New York. The capitalization is $15,000,000. The road proposes to run from Winnipeg to Manitou, thence through Southern Manitoba and Saskatchewan to Lethbridge. The road then strikes northeast to North Battleford, across to Prince Albert and Le Pas, thence south through Dauphin to Brandon, across again to Manitou and to Dominion City. The line proposed thence goes northeasterly to Glencross and Altona and back to Winnipeg.

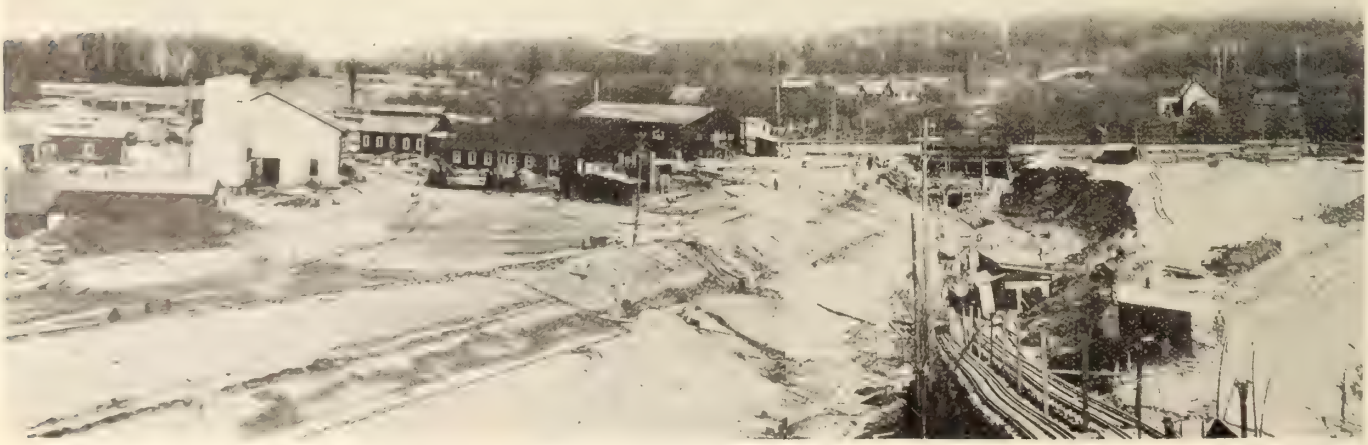


Fig. 6—General view of West Portal from crusher plant.

General Instructions to Inspectors of Street Paving

THE Bureau of Highways of the Borough of Manhattan, New York City, of which H. W. Durham is Chief Engineer, has recenly issued a small book of instructions to inspectors of street paving which contains a number of interesting and instructive points. Many, indeed, are general and are intended as guides to be used in conjunction with and as a supplement to regular contract forms and specifications. A brief abstract of some of these instructions is as follows:

The Intent of Instructions

The object and intent of these instructions is to secure full compliance with the contract and specifications and the performance of first-class work by the contractor in such minor details as are not specifically mentioned, but implied, by the contract and specifications.

General Instructions

The inspector is to report to and be under the control and direction of the Chief Engineer and his authorized assistants.

The inspector is to read carefully and make himself familiar with the contract and specifications for the particular work to which he is detailed.

The inspector is to assume that the contract and its specifications are entered into by the contractor in good faith and with a full understanding of the requirements; and that the contractor may be and must be held to a strict compliance with the specifications, unless the inspector receives instructions to the contrary from his superior officers.

The inspector will be held strictly responsible for the enforcement of the contract and specifications so far as these relate to the quality of the materials used and the manner of doing the work.

In case the contractor, or his agents or employees, shall refuse or fail to comply with the contract or specifications or to perform the work in accordance with the instructions from the assistant engineer in charge, or in a proper manner, the inspector is to direct the contractor to suspend the particular work at fault and to report the facts immediately to the assistant engineer; and the inspector is not to permit the work to proceed in disobedience of his requirements until instructions are received from the assistant engineer,

The inspector is to make out daily reports on the forms provided for the purpose, and also to keep in the notebook provided for each contract a detailed record of each day of the work, which must contain the following:

(1) The date of assignment to the contract and date of its actual commencement and completion.

(2) Detailed force account for each working day and amount of material used.

(3) Condition of weather each day.

(4) Delays, reasons for, and the period of duration.

(5) Railroad or other subsurface work being done within the limits of the contract whether by corporations or individuals, the date of beginning of such work and the date of completion

(6) Condition of the sidewalks within the limit of the contract at the commencement of the work.

(7) Accidents: Date of accident, names of persons concerned and witnesses of any circumstances governing the case.

(8) Quantity of new and old curbstone set and location of same.

(9) Any neglect or refusal on the part of the contractor to comply with the contract specifications.

(10) Damages to persons or property by reason of any act or omission on the part of the contractor.

(11) Oral instructions or orders received from the engineer in charge of the work; and all other matters appertaining to the contract that might be worthy of record.

It is the duty of the inspector to familiarize himself with the local conditions affecting the contract to which he is assigned, in order that the work at all stages may be so carried on as to cause the least possible inconvenience to the property owners on the street, and to the general public using the street. The street must not be unnecessarily obstructed, and the contractor must provide temporary bridging or passageways at crossovers and wherever else necessary.

All materials as they are brought on the street must be piled compactly and neatly on planks or metal boards in the roadway, or upon the sidewalk, at such points as the inspector designates. The inspector must see that all loose material and excavated matter, such as broken curbstone, old paving blocks, old asphalt and earth, are removed from the site of the work as soon after being excavated as possible. All unused or waste material of every sort must be removed from the roadway and sidewalk of any completed portion of the street at the time it is opened to traffic.

The inspector must see that city monuments and benchmarks are preserved from injury by the contractor, and in case of any displacement or disturbance of such marks must notify the assistant engineer in charge.

The inspector is to examine the material as it is brought on the work and see that it conforms to the specifications before permitting it to be used. It will be part of the inspector's duty to notify the office of the city chemist at the different stages of construction in due time to take the necessary samples of the different materials in each block. Should the inspector at any time suspect that the material used is not in accordance with the specifications, samples must be taken by him, with a record of the location, and the office of the city chemist notified immediately.

Preparation of the Sub-Foundation

Where earth excavation or embankment is necessary to bring the subgrade to proper grade, the important points to be looked after are:

(a) To bring the subgrade to the true and proper grade and contour required for the pavement.

(b) To properly consolidate the subgrade, so that it will furnish a firm support for the pavement and its foundation.

Curbing

In setting curbstone the important points to be looked after are:

(a) To see that the stones are set to the true grade and position.

(b) To see that the full space for concrete under and around the stone is provided.

(c) That the concrete used around the stone is of the specified quality.

(d) That the concrete is placed and compacted so as to fill all the space under and around the stone as specified

(e) That no foreign material, either dirt or broken bits [illegible] be permitted to become mixed with the concrete. The tendency of the workmen is usually to consider the minor details as unimportant and to slight them.

Mixing the Concrete

The contractor often desires to measure the sand and stone by wheelbarrow loads. In such cases the inspector will measure the capacity of the barrows used and determine the size and number of loads required for one batch of concrete, and thereafter insist that the loading conform to this standard size. As a check, the inspector should frequently keep account of the bags of cement and the barrow loads of sand and of stone used during, say, two hours, and measure the quantity of concrete made and determine from this data the ratio of the materials used. In any case the inspector must make return for the amount of material used during the day on his daily report by giving the exact quantities as counted by him both as to bags of cement and cubic yards of sand and stone used, and the quantities must not be estimated from calculations based on the amount of concrete laid.

When a concrete mixer is used the inspector must acquaint himself with the theory and principle of operation of that particular type of mixer and be able to detect any change in the proportions or uniformity of the mixture at any time.

When the mixer is of the automatic-feed type the inspector must test it at least once during each day's work, at times unexpected by the foreman, by feeding measured quantities of cement, sand and stone in the proportion of one, three and six into the respective hoppers. If the mixer is gaged properly and feeding freely the measured quantities of materials will be exhausted simultaneously. Should some cement be retained in the cement hopper after the sand and stone are exhausted, it is sufficient indication that the mixer is either improperly gaged or that the cement feed is clogged. Whatever the trouble, it must be corrected before the mixer is allowed to continue.

When the contractor employs a concrete mixer into which the materials are not loaded in batches, the inspector is not to depend for the securing of the proper proportions on the accuracy of the machine gaging or the proportion of shovelers used. The materials must be placed in properly proportioned piles, not containing more than 10 cu. yd. in the case of sand, broken stone or gravel, and the inspector must see that the machine exhausts all materials simultaneously. Should it be impossible to obtain these results, due to improper piling of material, the inspector must require the use of measuring boxes for proportioning the charge for the mixer.

Sheet-Asphalt Pavement

The principal care of the inspector will be to see that the asphalt is not laid at too low a temperature. The minimum temperature permitted by the specifications is 250° F. While the main or interior mass of a wagon-load may be well above that temperature, the top and outer part of the load may be, particularly in cold weather, too cold to be safely used. Some of this colder portion may be sufficiently reheated by mixing it with the hotter material if properly handled in unloading; but any material that is so cold as to be lumpy when unloaded or, more particularly, when being raked out, should be discarded. This applies to both surface and binder mixtures. The best practical guide is the manner in which the mixture behaves in raking. It should always be so hot that it will, under the rake, break up into a uniform crumbling or powdery mass. If it does not do this it is too cold whatever its temperature may be.

PREPARATION OF STREET SURFACES—Before the binder is laid, all loose material, rubbish, street dirt and other matter foreign to the concrete surface shall be removed and the concrete surface swept, with street brooms if necessary, to properly clean it.

Neither binder nor surface mixture shall be laid upon wet surfaces. Before the spreading of the surface mixture on the binder, the latter must be cleaned of all foreign matter and swept if necessary. If the binder course already laid has become covered with mud from wagons or other travel, it must be swept clean. No loose fragments of binder material must remain on the surface. Any part of the binder course that may have become broken or loosened must be taken up and new material laid in its place with the same care as the original.

LAYING BINDER COURSE—Nearly the same care in raking and equally as careful rolling should be required as for the surface course. If the binder is not thoroughly compressed and becomes cold before the surface course is laid, it is likely in future hot weather to soften and yield under heavy travel, and thus start small depressions in the pavement.

LAYING THE SURFACE COURSE—The joints against a cold edge of previously laid surface must be cut back until solid, fully compressed material of full thickness is reached, and the raw edge completely but thinly painted with liquid bitumen. No masses or fragments of cold mixture must be allowed to remain on the surface of the binder in advance of the placing of the surface course to be covered up by the latter. Such cold masses will not be compressed by the roller but will later, under a hot sun and heavy travel, yield and start depressions in the pavement. The raking requires to be properly and skillfully done. The tines of the rake must penetrate to the binder, so that the raked material will be a uniform mass from top to bottom.

ROLLING—The inspector must insist upon the roller being placed upon the freshly raked surface just as soon as the material will bear it without being squeezed out or displaced laterally. The tendency is to keep the roller off too long, thus permitting the chilling of the surface and preventing its proper compression. The inspector must not take the contractor's word as to how soon the rolling may be begun, but should have trials made until he is able to judge for himself.

The rolling of the heavy roller should be very thorough; the roller should be kept at work constantly until the surface is too cold to be impressed. In operating the roller lengthwise of the street the rolling should begin at the gutters and work toward the center of the street whenever practicable. Cross rolling and diagonal rolling must be insisted upon wherever the width of the street will permit.

Asphalt surface must not be laid when rain or snow is falling or so long as the surfaces are wet. Surface mixture raked out and caught in a shower before it is well enough rolled to exclude water must be taken up and discarded.

The inspector is to measure and record each day the area of pavement laid and the quantity (number of batches) of surface mixture used, and note any lack of uniformity in the area laid per batch.

Granite Block Paving

The more important things for the inspector to look after are:

(a) The quality and shape of the blocks.
(b) The sand cushion.
(c) The setting of the blocks.
(d) The ramming of the surface.
(e) The filling of the joints.

THE BLOCKS—Assuming that the general quality of the granite has been approved, the inspector will need only to observe and reject blocks made from soft or weathered or otherwise defective stone. Any material divergence of the blocks from the correct form or from the sizes specified as permissible will be readily caught by the eye as they are brought to the street, and can be thrown out.

The proper dressing of the blocks is important, and should be watched carefully. While the inspector is not expected to examine each individual block, close observation of the blocks as they are handled and laid will enable him to detect and reject those that are materially defective in shape or dressing; or excessively wide joints will call attention to them as they are set.

SAND CUSHION—Screened sand must be used for the cushion bed. It should be moderately coarse and must be fairly clean and pure. The tendency with contractors is to use any dirty sand or sandy loam available on the street. Such material, especially if it becomes filled with water, will yield under the blocks and will not support them properly. The sand bed should not vary materially in thickness. It should be laid and graded not more than 50 nor less than 20 ft. in advance of the setting of the blocks.

SETTING THE BLOCKS—The blocks of uniform width and depth must be selected for each course, and each block must be laid upon a full bed of sand and "struck in" at the base so as to bring the stone in close contact with its neighbor in the preceding course and thus insure the closest possible joint.

The inspector must see that the joints in the line of traffic are close, and must see that the alignment of the courses is true. This is most important, as a crooked or wavy course lessens the chances of getting close joints, not only along that particular course, but also along the courses that are to follow. The inspector must see that all longitudinal joints are broken by a lap of at least 3 in.

The operation of ramming is not to be permitted to approach within 20 ft. of the paving. After ramming the surface of the pavement may look somewhat wavy and uneven. The inspector must see then that it is back-rammed. All blocks below the general plans of the surface must be raised and more sand placed thereunder, and the blocks rammed again to an even bearing.

Bond stones with their upper surface set exactly to the grade or contour of the paving before ramming must be set in lines across the street at intervals of not more than 6 ft. and with at least three such stones in each line on a 30-ft. roadway and five on a 60-ft. roadway. Care in setting these stones and in paving to the lines defined by them will prevent the completed surface of the pavement having the wavy appearance so often seen.

Whether sand or grit is used for partly filling the joints before the paving cement is poured, care must be exercised in placing the sand or grit in the joints. Dumping a wheelbarrow load on the surface and then sweeping the joints full is absolutely forbidden.

Sand and grit or gravel should be dried before being used and put into the joints to as nearly as possible a uniform height as called for in the particular class of granite pavement.

RAMMING THE SURFACE—This part of the work is likely to be slighted unless carefully watched. The important thing is to have each block equally and sufficiently rammed to bring it to a solid bearing on the sand, as well as to bring its top to the proper grade. The rammer will be disposed to touch lightly blocks or areas which, if thoroughly rammed, would be driven below the true surface of the pavement, and subsequent travel may force these down, making depressions in the surface. The inspector must give this item of the work special attention.

The municipality of Chilliwack, B.C., have withdrawn their advertisement asking for tenders for installing a sewerage system owing to the present financial stringency. The matter has, however, only been postponed.

Mainly Constructional

The News in Brief—From Coast to Coast

Mr. John Breckenridge, well known as a railway contractor in the West, died recently at Calgary.

Messrs. Stevens & Lee, architects, Toronto, have removed from the Pacific Building to 2 College street.

A Builders' Exchange was formed recently at Brandon, Man., and officers were elected for the ensuing year.

Messrs. Harris & Company are a new Toronto architectural firm who have opened offices at the corner of Bloor and Lansdowne avenue.

Building permits at London, Ont., for the first five months of 1913 amounted to $908,214, as against $290,728 for the corresponding period of 1912.

The city council of Toronto decided recently to guarantee the bonds of the Toronto Housing Company to the extent of $850,000 or eighty-five per cent. of the total.

Now that the city of Victoria has secured further funds for waterworks purposes, a number of extra men will be put on the Sooke Lake development works and good progress is hoped for.

The first steel out of Fredericton on the St. John Valley Railway is being laid this week, and rapid progress is being made by the track laying crew. The work is to be pushed forward as rapidly as possible.

The Steel Company of Canada, Limited, have taken over the business of the Maritime Nail Company at Fort William and will erect a plant there at a cost of about $300,000. Work on construction will be started immediately.

Construction on the Grand Trunk Pacific Railway east of Prince Rupert has reached Beament station—199 miles from the Pacific Coast. It is expected that 275 miles altogether will be completed from the west end this year.

It was stated recently that the Canadian Pacific Railway would spend $1,500,000 on Vancouver Island lines. The expenditure stated will be confined to the railway itself and additional sums will be spent on the new terminals in Victoria.

According to a recent announcement, the Hudson's Bay Company will build a ten-storey apartment store on Portage avenue, Winnipeg. The building will be 165 feet high and will have 24 acres of floor space. Provision will be made for additional storeys.

The Grant-Smith-McDonald Company have been awarded the contract by the Canadian Pacific Railway for the following double track work in the west: Revelstoke to Taft, Westmore to Kamloops and Kamloops to Tranquille. The work covers about 55 miles or line.

The Dominion Government have promised to provide suitable accommodation for the ever-increasing number of immigrants arriving at Toronto. The accommodation for the present will be temporary, but permanent accommodation will be provided near the Union Station at an early date.

Mr. William Simpson, Toronto, whose death occurred recently, was a builder and contractor on a large scale. Among some of the largest contracts he had undertaken were the Canada Life Building, the Bank of Hamilton and some of the legislative buildings. He was sixty-nine years of age.

It is expected that the contracts for section 1 of the Welland Canal will be let during the course of this month. The section includes the harbor and lock [illegible]

[illegible], will cost four million dollars. The harbor will be three miles west of Port Dalhousie, the terminus of the present canal.

The [illegible] Construction Company, Seattle, Wash., has been awarded the contract by the Provincial Government of British Columbia for the construction of an $80,000 bridge over the Thompson River, New Lytton, B.C. The bridge will have one span of 250 feet, concrete piers and steel superstructure.

Contracts for the new Canadian Pacific Railway shops to be erected at McAdam Junction, N.B., were recently awarded to Mr. Henry Post, of Woodstock. The new shops will be of concrete and steel and will be modern in every particular, being operated with electric motor power. The work at McAdam involves an expenditure on the part of the C. P. R. of about $100,000.

The C. P. R. is completing the stations at Hassan, Makepiece and Granta on the Bassano-Irricana line in Alberta. Only one more station house remains to be built at Chancellor. A new siding about half a mile long is being provided at Bassano to accommodate the Continental Oil Company and other warehouses.

Mr. F. W. Stuart Williamson, consulting engineer, of Montreal, has submitted a plan for underground tramways to the Montreal Board of Commissioners, which has been referred to Mr. Janin, the chief engineer. Mr. Williamson estimates that for $20,000,000 12½ miles of underground two-track lines can be provided, while the total cost of a four-line tube would be about $30,000,000.

A dispatch from Truro states that there is noticeable activity on the Dominion Atlantic Railway, a subsidiary of the C. P. R. Working trains bearing engineers, materials, machines, gear and other equipment are passing through Truro daily for different points on the line, where new roadbed, new bridges, new rails, improvements to track, stations, roundhouses, work shops, etc., are to be made.

Mr. Samuel Hill, President of the American Road Builders' Association, at the invitation of President George McAneny of the Borough of Manhattan, and President Cyrus C. Miller of the Borough of the Bronx, New York City, on May 26th delivered an illustrated address on the subject, "The Highways of the Northwest," at the residence of President McAneny, before an assemblage of over fifty municipal engineers who are in charge of the highways of Greater New York.

Plans and specifications have been prepared for a residential district on Therese Island, in the St. Lawrence, which it is proposed to connect to the mainland by means of a bridge. The idea is to form a trust company, with a capital of five million dollars, which will establish a municipality on the island. Telephone, electric light and power wires will be placed underground, while the heating of the houses will be governed from a central point. It is also proposed to construct a pier with a pavilion, and a breakwater for yachts, launches, etc. The plans provide for a theatre, an arena, and other places for amusement.

During last year the earnings of the P. Lyall & Sons Construction Company, Limited, Montreal, were $258,697, and after the payment of the bond interest and preferred stock a balance remains of $89,232. After putting $40,000 to reserve, $49,232 is carried forward. The earnings in 1912-1913 were the largest in the history of the company. The directors state that the contracts on hand amount to $4,000,000, as compared with $3,000,000 at this time a year ago. Last year the company established new plants at Toronto, Winnipeg, Swift Current, St. Andrews and Wallace, in addition to the plants already established at Montreal, Regina, Moose Jaw and Calgary.

The Canadian Pacific Railway have awarded a contract to John S. Metcalf Company, Limited, Montreal and Chicago, for the construction of all of the buildings along the new line of the C. L. O. & W. Railway, about 180 miles in length, extending from the present main line at Glen Tay, Ont., near Smith's Falls, to the main line at Agincourt, not far from Toronto. The contract includes seven brick stations, twelve wooden stations, nine 40,000-gallon water tanks, a twelve stall engine house with turntable, machine shop, coaling plant, ash pit and sand house, nine freight sheds, an ice house, seven station residences, twenty-five tool houses, and miscellaneous buildings, a total of about eighty-five structures. Work on the new line is progressing rapidly and it is the intention to have all of the above buildings ready for use by the end of the present year.

With a view to ascertain whether the charges of faulty design of the Montreal filtration plant are justified, the city have appointed Messrs. P. W. St. George, J. A. Jamieson, and F. A. Barbour to make an investigation. It will be remembered that the contractor, Mr. Norman M. McLeod, served a notorial protest on the city alleging that the designs by Messrs. Hering & Fuller, New York, were not satisfactory and that the site of the plant was unsuitable. Messrs. Hering & Fuller and the city officials deny these charges, which, however, were strongly backed up by Messrs. Henry Holgate, M. J. Butler, W. J. Francis and Ernest Marceau. It is said by the city that the subsidencies on the work were due to the action of the frost, and not to the presence of quicksand in the soil as alleged on behalf of the contractor. Mr. P. W. St. George was the former city surveyor, Mr. Barbour is a civil engineer of standing, and Mr. Jamieson is an engineer who specializes on elevators, and who has done some important work both in Canada and in the United States.

Publications Received

The Modern Asphalt Pavement, by Clifford Richardson; published by Jno. Wiley & Sons, New York. This is the second edition, revised and enlarged, of a book for which there has been much demand during the last three years. The present work will appeal to municipal engineers and others who have made a special study of the subject. It includes exhaustive data regarding the chemistry of asphalt and the technology of the industry. The object is to demonstrate the nature of asphalt pavements, to point out defects and to bring about improved methods of construction. The author's observations are valuable, inspired as they are by the experience of over twenty years in various cities of the United States and Europe and upon work involving the construction of between twenty and thirty million yards of surface.

Flat Plate Theory of Reinforced Concrete Floor Slabs, by Henry T. Eddy, Chicago; published by Rogers & Co., Minneapolis; price $5. The theory of the flexure and strength of rectangular flat plates applied to reinforced concrete floor slabs. This book cannot fail to be received with great interest since it is the first treatment of this subject of such scope and completeness as to furnish a reliable basis for design, which is in agreement with the results of an extensive body of measured tests of buildings already constructed and accepted on the basis of those tests. Dr. Eddy's work is mainly a discussion of the mushroom system and is intended as an advance chapter of a more comprehensive treatise on Concrete-Steel Construction, in which it is intended to treat somewhat fully concrete, columns, beam and slab construction, wall panels, etc., as well as flat slabs, and to introduce the results of experimental work now under way to determine the value of Poisson's ratio for different combinations of steel and concrete.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Edmonton, Alta.

Clerk, C. Cox. Engineer, A. J. Latornel. Council have authorized Commissioners to spend $125,000 upon further provision for the sedimentation and filtration of water at the present pumping station. Will construct 5,000,000 gal. sedimentation basin. Estimated cost $50,000, and clear water basin, estimated cost $64,000. Remainder will be spent for incidentals.

Ft. Francis, Ont.

Roadways, cost $100,000, planned by Ontario Government. Road Commissioner, J. F. Whitson, Parliament Bldgs., Toronto. Rainy River valley trunk and other roads to be completed during 1913. 100 miles new road. 50 miles old road repairing and grading.

Kamloops, B.C.

$100,000 will be spent in adding to and improving the waterworks. By-law carried. Clerk, J. J. Carment.

Hull, Que.

Asphalt pavement, Notre Dame. Mayor, Dupuis. Specifications and plans at office of J. A. Laforest, City Engineer. Tenders will be called shortly.

Merriton, Ont.

Sidewalks, cost $20,000, contemplated by the village council. Clerk, Richard Clark. Ratepayers will vote on by-law June 18th.

New Westminster, B.C.

Sewer system planned by City Council and Municipality of Burnaby. Clerk, W. J. Duncan. Ratepayers voted expenditure of $150,000.

By-law was passed to improve and extend present water system at a cost of $45,000. Clerk, W. J. Duncan.

Ratepayers passed the by-law voting expenditure of $200,000 for paving and roadways. Clerk, W. J. Duncan.

Orillia, Ont.

Reconstruction of waterworks system, cost $50,000, planned by town council (Water, Light and Power Cimmission). Clerk, C. E. Grant.

The Pas, Man.

Tenders received by Sec.-Treas., H. H. Elliott, M.D., for tender (b) trenching and laying approximately 4,400 ft. 12-in. steel pipe; 3,500 ft. 10-in. steel pipe; 4,400 ft. 8-in. steel pipe; 2,000 ft. 6-in. steel pipe. Setting valves, hydrants, etc., and backfilling. Specifications at office of Consulting Engineers, Canadian Engineer, 820 Union Bank Bldg., Winnipeg, and Resident Engineers office, The Pas, also for tender (a) supply and delivery of 3,770 ft. 24-in. vitrified sewer pipe; 5,470 ft. 20-in. vitrified sewer pipe; 2,000 ft. 18-in. vitrified sewer pipe; 600 ft. 15-in. vitrified sewer pipe; 1,200 ft. 6-in. vitrified sewer pipe, excavating, laying and construction of manholes, catch basins, etc. Specifications, etc., at office of Consulting Engineers, Canadian Engineer, 820 Union Bank Bldg., Winnipeg. Tender (d) for erection of pole line. Tender (f) for supply and delivery of poles, wires and line material. Specifications at offices of Consulting Engineers, Canadian Engineer, 820 Union Bank Bldg., Winnipeg, and Resident Engineer, The Pas. Consulting Engineers, Murphy & Underwood, Ross Block, Saskatoon.

Timmins, Ont.

Waterworks. Mayor, D. M. Wilson. Clerk, T. M. Wilson. Engineer-in-charge, Sutcliffe & Neelands, New Liskeard, Ont., have been appointed to prepare a report on the cost of installing system. In the meantime a temporary system is being installed.

Wallaceburg, Ont.

Sewage and waterworks system, planned by town council. Clerk, H. E. Johnson. By-law passed June 2nd $130,000 to provide for the work.

Winnipeg, Man.

Tenders received by Secretary, M. Peterson, till June 12 for water mains in Church, Main, Prince, Artillery, College, Battery, Mortimer, St. John, Athole, Cathedral, McKenzie, Anderson and Magnus streets. Specifications, etc., at office of engineer, H. N. Ruttan, 223 James avenue.

Tenders received by Board of Control, Secretary, M. Peterson, for valves, steel pipe, etc., for connections to new 18,000,000 gal. reservoir. Specifications at office of engineer, H. N. Ruttan, 223 James ave.

$280,000 will be appropriated for booster pump on domestic water main supply for both the King Edward and King George hospitals. M. Peterson, Secretary Board of Control.

Twp. of Woolwich, Ont.

[illegible] Clerk, W. J. Snider, Conestogo, Ont. Tenders received by Engineers, Bowman & Connor, 36 Toronto street, Toronto, until June 14th. One single 30 ft. concrete arch; 1 single 50 ft. concrete arch; 1 double 50 ft. concrete arch. Concrete road in St. Jacobs. Further information from Engineer.

CONTRACTS AWARDED

Calgary, Alta.

Paving. Clerk, J. M. Miller. Engineer, Geo Craig. General contractors, Crown Paving & Construction Company, [illegible] per sq. ft. for all streets without car tracks on north side; $2.55 per sq. ft. for all streets without car tracks; $2.65 per sq. ft. for all streets with car tracks; $2.75 per sq. ft. for all streets with car tracks on North. 65c per lin. ft. for curb and gutter.

Medicine Hat, Alta.

Reservoir in connection with waterworks plant. Engineer, A. R. Grimmer. General contractors, Hotson & Leader.

Montreal, Que.

Concrete sidewalks, planned by Outremont Town Council. Sec.-Treas., E. T. Sampson. General contractor, R. T. Smith & Co., 175 Metcalfe ave., $42,362.

Fire and police station, cost $50,000, Notre Dame, planned by Board of Commissioners. Sec., L. N. Seneca1. Architect Alphonse Piche, 52 Victoria square. General contractor, L. Langevin, 228 Parc Lafontaine. Heating and plumbing, P. Page, 58 Amherst. Two stys., 120 x 70. Excavation started.

Saskatoon, Sask.

Storm sewers, cost $28,189.05. City Council. Engineer, Geo. T. Clark. General contractors, Bitulithic & Contracting Co., 238 Tache avenue, Winnipeg. For excavation and laying of several sizes of pipe under their pavements, including 18 manholes, 51 catch basins.

Winnipeg, Man.

Granolithic walks, Levis street. Contract awarded to J. W. Astley, Engineer of Construction City Yards for walk, on west side of Levis street from Vaudreuil street to Louise Bridge. Specifications, etc., at office of Engineer, H. N. Ruttan, 223 James avenue. Board of Control. Sec., M. Peterson.

Sewer. Rural Municipality of Assiniboia. Sec.-Treas., Frank Ness, Kirkfield Park P.O. General contractors, Thos. Jackson & Sons, 370 Colony street. For construction of sub-main on Bruce street from Conway street to Berlin street through Deer Lodge, Park, Ravenswood and Oakdale Park.

Water conduit, cost $3,312. Sec., M. Peterson, Board of Control. Engineer, H. N. Ruttan, 223 James avenue. General contractor, J. W. Astley, Engineer of Construction City Yards, for 12-in vitrified pipe from well No. 9 to well No. 8.

Conduit runs. Board of Control, Secretary, M. Peterson. City Electrician, F. A. Cambridge. General contractors, Wil- [illegible] conduit runs on Portage ave. from Colony to Maryland street.

Railroads, Bridges and Wharves

Ancrum, Sask.

G. T. P. Co.'s location of station at Ancrum in Sec. 29-33-27 W-2M has been [illegible]

[illegible] Standard Structural Plan No. [illegible]

Brantford, Ont

Two [illegible] and on Queen street planned by City Council. Clerk, F. H. Leonard. Engineer, T. Harry Jones.

Cayuga, Ont.

Tenders received by chairman until June [illegible], for repairs to east abutment, county bridge. Plans and specifications at office of engineers. Chairman Bridges Committee, Wm. Bain, S. Cayuga. Engineers in charge, Jackson & Kidd, Dunnville.

Fort William, Ont.

G. T. P. Rly. Co. has been authorized to construct spurs to serve Copp Stove Company and Jas. Murphy.

Hitchcock, Sask.

C. P. R. Co.'s location of station on S.W. ½ Sec. 23-3-9 W-2-M at Hitchcock, Sask., has been approved.

Medicine Hat, Alta.

By-law passed awarding The Montreal Engineering Co., street railway franchise. Work to be commenced within 90 days, and first 3 miles to be completed and in operation within 9 months.

C. P. R. Co. has been authorized to construct spur for the Medicine Hat Pump & Brass Manufacturing Company, Limited, in N.E. ½ Sec. 30-12-5 W-4-M.

Malbaie, Que.

Pier. Dominion Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Three cribs, 30 ft. bet. cap pieces, 112, 100 and 188 close-faced crib work, also 202 x 22 open-faced total 502 ft. Batter of 1-in. 8 outside and 1 in. 10 inside. Tenders received by Secretary until June 24th.

Neeby, Sask.

G. T. P. Branch Lines Co.'s location of station at Neeby in Sec 20-34-27 W-2-M on Prince Albert Branch has been approved.

Nolan Station, Alta. (Near)

C. P. R. Co. has been authorized to construct bridge No. 98.1 on MacLeod Sub. Div., Alta Div., over Willow Creek, near Nolan Station.

County of Peel, Ont.

Bridges planned. Form of tender at office of Engineer, C. R. Wheelock, Orangeville, Ont., who will receive tenders up to 8 p.m. June 14th, for construction and erection of 2 low truss, box cord, steel highway bridges, 40 ft. and 45 ft. span.

Port Arthur, Ont.

Dredging. Specifications and form of tender at office of Sec., R. C. Desrochers, Ottawa. Dom. Govt. Dept. of Public Works., who will receive tenders until June 13th.

Resplendent, B.C.

G. T. P. Co.'s proposed location of station at Resplendent, Lot 5664, Range 3, Cariboo Dist., B.C., M. 1072.4, west [illegible] from [illegible]

St. John, N.B.

Railroad construction. C. P. R. Co., head office, Montreal, proposes to lay 14.2 miles of 85 lb. rails on the main line between St. John and McAdam Jct., on the Atlantic Dis., releasing a similar mileage of 80-lb. rails. On branch lines of the division 126 miles of line now laid with 48, 56, 60 and 62 lb. steel, is to be relaid with 72, 73 and 80 lb. steel.

St. Catharines, Ont.

Tenders received by Secretary, L. K. Jones, Dom. Govt., Dept. of Railways & Canals, Ottawa, until July 17th, for Section No. 1, Welland Ship Canal. Plans and specifications at office of chief engineer of Dept., Ottawa and at office of engineer in charge, St. Catharines, Ont.

Twp. of Tay, Ont.

Two bridges planned by Twp. Council. Clerk, T. W. Brown, Victoria Harbor. Tenders will be called.

Vancouver, B.C.

C. P. Rly. Co. has been authorized to construct bridge No. 68.3 over Harrison River, Cascade Sub Div., B.C. Div., B.C.

Welland, Ont.

Subway, cost $20,000, planned by Niagara, Welland & Lake Erie Electric Railway. C. J. Laughlin, Jr., Welland. Engineer, Mr. Cummings, Welland. Agreement has been completed for construction of subway under Michigan Central Railway.

Extension of electric railway to Welland Jct., planned by Niagara, Welland & Lake Erie Electric Railway. C. J. Laughlin, Jr., Welland. Engineer, Mr. Cummings, Welland. Line also to be extended into Twp. of Crowland, Ont. Some new street cars to be purchased.

CONTRACTS AWARDED

Montreal, Que.

Ditching and grading, cost $22,500, Greenfield Park, planned by Town Council. General contractors, Messrs. Massicote & Bros., Montreal.

Toronto, Ont.

Dredging planned by Harbor Commissioners. Sec., A. C. Lewis, 76 Adelaide west. General contractors, Canadian Stewart Co., H. O. Montreal. Local office, No. 1 Wellington west. 31,000,000 cubic yards.

Retaining wall, cost $6,953, Withrow avenue. Mason, Jas. A. Wickett, Ltd., 28 Toronto street.

Public Buildings, Churches Schools, etc.

Burnaby, B.C.

School, cost $65,000. Clerk, Arthur G. Moore. Architect, J. H. Bowman, Crown Bldg. Eight rooms, concrete construction, fireproof assembly hall. Tenders will be called shortly.

Collingwood, Ont.

Public building. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until June 23rd. Plans, specifications, etc., at offices of Philip C. Palin, architect, Collingwood, Thos. A. Hastings, Clerk or works, Postal Station "F." Yonge St., Toronto, and at Dept., Ottawa.

Coquitlam, B.C.

School, cost $13,000. Architect, T. H. Bamforth, 319 Pender street west, Vancouver. Six rooms, frame construction. Plans ready, tenders will be called.

Edmonton, Alta.

Alterations to roller rink, cost $4,000, Second avenue north, planned by Strathcona Rink Assn., c/o T. Walsh, Commercial Hotel, Whyte Ave. Tenders open. For laying hardwood floors, and other alterations, dimensions 110 x 225.

Fergus, Ont.

Armory contemplated by Dom. Govt. Dept. of Militia & Defence, Ottawa. Sec., E. F. Jarvis. Site purchased, 86 x 150, and plans will be prepared.

Hamilton, Ont.

Addition to school, cost $5,000, planned by Twp. School Board, J. Lewis, Dundas road, Rural Delivery. Architects, Rastrick & Son, 30 King street east. One storey addition, 67 x 40, brick construction.

Meota, Sask.

Public school, cost $10,000. Sec., S. Kilgour. Architects, Stephenson, Evans & Fillingham, North Battleford. Two storeys, 60 x 60. Plans accepted.

Montreal, Que.

Alterations to church, cost $25,000, for R. C. Congregation, St. Henri Parish. Architect, A. Decarie, 608 New Birks Bldg., Montreal, reports plans will be ready to call tenders in about a week.

New Westminster, B.C.

Fire hall and police station, cost $20,000, Sapperton, planned by City Council. Clerk, W. J. Duncan. By-law passed.

Addition to load registry office, cost $30,000. Prov. Govt. Dept. of Public works. Architects, Gardiner & Mercer, Westminster Trust Bldg. Three storeys, 46 x 43, reinforced concrete and brick construction. Tenders called shortly.

Exhibition improvements, cost $25,000, planned by Town Council. Clerk, W. J. Duncan. By-law carried.

Schools, cost $57,000, planned by City Council. Clerk, W. J. Duncan. Ratepayers passed by-law voting about expenditure.

North Battleford, Sask.

Carnegie library, cost $15,000, contemplated by the Town Council. Architect not yet decided on. Mayor, D. S. Walker will furnish all particulars .

Ottawa, Ont.

Tenders received by A. Johnston, Deputy Minister of Marine & Fisheries, until June 30, for construction of a reinforced concrete tower, wooden dwelling, boat house and oil store at Main Duck Island, Lake Ontario. Plans and specifications, etc., at Dept. Marine & Fisheries, Ottawa, and post offices, Kingston, Picton, Bath, Deseronto, Trenton and Gananoque.

Tenders received by A. Johnston, Deputy Minister of Marine & Fisheries, until June 30 for construction of a wooden lighthouse tower to be erected on a wharf at Portapique, Bay of Fundy, Colchester County, Nova Scotia. Plans and specifications at this Department, Halifax and at post offices, Parrsborough, Portapique, Truro, Shubenacadie and Tatamagouche.

Owen Sound, Ont.

Armoury, cost $25,000, is under consideration of Dom. Govt. Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa.

Peterboro, Ont.

Addition to All Saints Church planned. Tenders received until June 16th by H. P. Morgan, 387 Reid street.

Church and school, cost $80,000, Rubidge, for Methodist Congregation. Pastor, Rev. J. T. Mansell, Reid street, Peterboro. Chairman Building Commission, W. G. Morrow. Architects, Burke, Horwood & White, 28 Toronto St., Toronto. Tenders received by Chairman until June 18th. Specifications at office of Chairman or Architect. Capacity of church, 800, cut stone and brick construction, stone and cement foundation.

Port Coquitlam, B.C.
School, cost, $17,000, contemplated by the Board. Architect, J. Z. Long, prepared plans, which were selected in competition.

Rock Island, Que.
Town hall planned. Tenders received by Mayor, F. W. D. Melloon, until June 14th.

Sudbury, Ont.
Tenders received by Dom. Govt., Dept. of Public Works, Secretary, R. S. Desrochers, Ottawa, until June 23rd. Plans and specifications at office of Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, Post Office, Sudbury, Ont., and at Dept., Ottawa, for public building.

Toronto, Ont.
Schools contemplated by Board of Education. Secretary, W. C. Wilkinson, City Hall. Sites purchased, 535 x 240, Roach and Alice streets, 420 x 420 Dufferin street and Davenport road.

Postal station "G," cost $200,000, Queen and Saulter streets. Dom. Govt. Dept. of Public works. Sec., R. C. Desrochers, Ottawa. Tenders will be received by Secretary until 4 p.m. June 25th. Plans and specifications at office of E. J. Lennox, architect, 164 Bay street, and at Dept., Ottawa.

Armory, at West Toronto, contemplated by the Dom. Govt. Dept. of Militia and Defence, Ottawa. Sec., E. F. Jarvis.

Winnipeg, Man.
Fire stations, Pembina street and Arnold avenue, and Westminster and Lipton street, planned by Board of Control. Sec., M. Peterson. Tenders will be called shortly.

$5,000 will be appropriated for building for storage purposes in accordance with recommendation of Hospital Commission. Sec., M. Peterson, Board of Control.

Tenders received by Parks Board till June 16th for construction of open air swimming bath in City Park. Specifications at office of Architect. Sec., J. H. Blackwood, 229 Chambers of Commerce. Architect, G. W. Northwood, 502 Northern Crown Bank Bldg.

CONTRACTS AWARDED

Calgary, Alta.
School, cost $163,000, Bridgeland. General contractor, R. A. Brocklebank, Bell Block, 2nd street east. Heating and plumbing, E. J. Young & Company, Young Blk., 7th avenue east, for $28,300.

Edmonton, Alta.
Public school, cost $123,000, 3rd. Sec.-Treas., Mr. Brady. Architect, G. E. Turner, Mortlake Block. General contractors, Doyle, Thomas & Chistensen, 203 Purvis Blk. Three [illegible] brick, cement and concrete foundation.

North Battleford, Sask.
School, cost $109,860. Sec.-Treas., H. Basil Thomas. Architects, Stephenson, Evans & [illegible] General contractors, Reed, McDonald & Brewster, 619 4th street, Edmonton. Brick, Cookson Bros. Four storeys, structural steel, stone and brick construction.

Business Buildings and Industrial Plants

Calgary, Alta.
Stores and apartments, cost $25,000, planned by A. Allen, 10 6th avenue west. Two storeys, 50 x 130, brick, cement foundation, felt and gravel roofing. Will be erected on site of old block which was destroyed by fire.

Edmonton, Alta.
Cigar factory and warehouse, for H. V. Shaw, 745 5th street. Architects, Magoon & MacDonald, 604 Teglar Block. Four storeys, 50 x 150, concrete foundation, brick construction. Plans drawn. Will not be erected till early next spring.

Ft. William, Ont.
Grain drying plant, cost $8,000, Hardisty, for F. A. Guy & Co., Graham & Horne Block. Plans in progress.

Goderich, Ont.
Factory, cost $42,000, planned for Rice Knight Co., 88 Richmond street east, Toronto. By-law has been passed. Tenders will not be called before August 1st.

Hamilton, Ont.
Alterations and addition to store, cost $15,000, for M. & S. Epstein, Dom. House Furnishing Co., 120 James St. N. Three storeys, 70 x 100, pressed brick and stone caps construction, cement foundation. Plans in progress.

Ingersoll, Ont.
Town granted loan of $20,000 for 20 years to Standish Mfg. Co., 11 Colborne St., Toronto., who will establish factory to manufacture washing compounds.

Medicine Hat, Alta.
Warehouse contemplated by Trites-Wood Co., Fernie, B.C., wholesale hardware. Plans in progress.

Mill planned by Maple Leaf Milling Co., Board of Trade Bldg., Toronto. Site purchased. Tenders will not be called before September. Capacity, 4,000 bbls.

Cement products plant is under contemplation. Interested, J. A. Hollingshead, 16 Ottawa Street.

Stores and apartments, Braemar St., for John Kennedy, 522 6th Ave. Three storeys, 50 x 100, brick construction. Plans in progress.

Factory, cost $50,000, for The Medicine Hat Pump & Brass Mfg. Co., Ltd. Manager, W. G. Nesbit. Will require [illegible] Plans in progress.

William Rutherford and M. N. Merrian have entered into contract with city to construct a woodworking and planing mill on one of the industrial sites, at a [illegible]

Montreal, Que.
[illegible] ent, for Can. Stove & Furniture Co., Ltd., St. Catherine and Delorimier streets, Montreal. Manager, Mr. Panneton. Architect, W. A. Mahoney, Telephone Bldg. Guelph, Ont. Tenders will be called [illegible]

Store and flats, cost $5,000, Church street, Verdun. Owner and builder, [illegible] O. Hamelin, 246 Church ave. Three storeys, 25 x 45, brick, cement foundation, felt and gravel roofing. Owner calling tenders for plumbing, electric lighting and roofing. Tenders close June 13.

Warehouse, cost $4,000, Melrose, for A. Egan, 4834 Sherbrooke west. Architect, Mr. Harris, 180 St. James, is preparing plans. Two storeys, 22 x 35.

Moose Jaw, Sask.
Tractor factory contemplated for Canadian Phoenix Tractor Co., Ltd., head office, Eau Claire, Wis. Company will incorporate shortly.

Oakville, Ont.
Paint factory contemplated for Jas. Langmuir & Co., 1372 Bathurst street, Toronto. By-law to be submitted.

Redcliffe, Alta.
Stoocker factory, cost $75,000, contemplated by The Hammond Stoocker Co. Will manufacture grain shockers. Plans in progress.

Shoe factory, cost $75,000, contemplated by the Alberta Shoe Co. Manager, F. C. Young. Promoters, Stoner, Lockwood & Wheeler, Redcliffe.

Sault Ste Marie, Ont.
Store and residence, cost $7,000, for J. L. McDonald, Queen street. Two storeys and basement, 33 x 65, pressed brick construction, cement foundation. Plans in progress.

Timmins, Ont.
Mill addition planned for McEaneny Mine. Supt., J. Summerhayes, c/o Mine. Additional 15 stamps being added to the 5 stamp mill, and adoption of cynidation treatment of ore.

Toronto, Ont.
Store and residence, cost $5,000, Danforth, for H. Ellis, 333 College. Architect, A. M. Charman, 721 Palmerston. Two storeys, 25 x 50, brick construction, cement and brick foundation. Plans drawn.

Brick plant contemplated by A. H. Wagstaff, 362 Greenwood Ave. Site purchased on Wexford Road, near Scarboro Junction.

Bank building contemplated at S.E. Cor. Queen & Yonge, by Imperial Bank, head office Wellington and Leader lane.

Vancouver, B.C.
Can factory for The American Can Co., Chicago, Ill. West manager, F. D. Kendall, Portland, Ore. Site on Railway Street is being cleared of present structure. Plans completed.

Victoria, B.C.
Hotel, Broad street, for Adams Bros. Architect, Jesse M. Warren, 503 Central Bldg. Six storeys, 25 x 75, reinforced concrete construction. Plans in progress.

Hotel, cost $25,000, Store and Cormorant streets, for Victoria-Phoenix Brewing Co., 1921 Grosvenor street. Architect, Jesse M. Warren, 503 Central Bldg., is preparing plans. Four storeys.

CONTRACTS AWARDED

Calgary, Alta.
[illegible] 2nd street west, for W. J. Gourley, 614 6th avenue west. General contractors, Collins Bros., 1235 12th avenue west. [illegible]

[illegible]

[illegible] for Sherwin Williams Paint Co., [illegible] Centre street, Montreal, Que. Architects, Hodgson, Bates & Beattie, [illegible] Exchange Bldg. General contractors, Carter-Halls-Aldinger Co., 216 New Burns Block. Three stys., brick construction, stone and glazed brick faced.

Edmonton, Alta.

Stores and rooms, cost $5,000, Kinistino, for J. T. Fukie, 438 Kinistino. General contractor, A. G. Ferguson, General Delivery. Two storeys, 30 x 75, brick foundation, frame construction. Excavating started.

Stores and office building, cost $20,000, for Wm. Baxter, 1112 Jasper ave. N. Architect and general contractor, D. Sewell, 540 Stoney Plain Rd. Two storeys, 26 x 62, brick, concrete foundation. Store fronts and fixtures.

Stores and apartments, cost $30,000. Owner and general contractor, Jno. Hagmann, 789 Fraser Ave. Architect, T. C. Pennie, 161 Cliff street. Three storeys, 93 x 40, brick and structural steel construction.

Ft. William, Ont.

Addition to broom factory, cost $2,500, for Gilbert Hartley, McTavish street. Architect, R. E. Mason. General contractor, Peter Bell. Frame construction, cement foundation. Excavating started.

Hamilton, Ont.

Storage building, cost $30,000, for Canadian Colored Cotton Mills, Limited, 352 McNab street north. Architect, Stewart McPhie, Bank of Hamilton Bldg. Mason, Geo. E. Mills, 614 King E. Excavating started.

Two factory buildings, cost $10,000, Sherman avenue. Canada Steel Co., Sherman avenue. Architects, Prack & Perrine, 36 James street south. General contractors, H. G. Christman Co., Chancery Chambers. One storey, each, brick construction, reinforced concrete and waterproof roofing.

Haney, B.C.

Warehouse for The United Farmers, Ltd. General contractors, E. Rosse & Co. One storey, 24 x 100, frame construction.

Montreal, Que.

Iron foundry, cost $15,000, St. James, for R. Mitchell, 69 Belair avenue. Builders and general contractors, The James Sheam Co., 225 St. Patrick Street. One storey, 180 x 108, concrete foundation, felt and gravel roofing.

North Battleford, Sask.

Office building, cost $15,000, Main St., for H. W. Petroiller. Architects, La Chance, Favell & Howenstein, North Battleford, Saskatoon and Yorkton. General contractor, Geo. Quaadman. Heating and plumbing, B. W. Lewis. Three storeys, 35 x 70, brick construction.

Peterboro, Ont.

Two factory buildings, cost $7,000 ea. (Park), for Canadian General Electric Company. Manager, E. G. Patterson. Architects, G. M. Miller & Co. General contractors, Finnie & Gordon and Jas. Hayes, 219 Park street. Solid brick construction, cement foundation, prepared roofing. One building 1 storey, 52 x 127. One building, 2 storeys, 68 x 20.

Peterboro, Ont.

Factory (Monaghan Rd.) for Henry Hope & Sons, Ltd. Architects, Sproatt & Rolph, 36 North Street, Toronto. General contractors, Richard Sheehy. Carpentry, Finnie & Gordon. Work to start at once.

Point Grey, B.C.

Garage and residence, cost $22,000, for Walter F. Evans. Architects, R. McKay, Fripp, Hutchinson Block, Vancouver. General contractor, Rand F. Watson, Kerrisdale. Two storeys, frame construction.

South Vancouver, B.C.

Stores, cost $7,500, for Wing Sang. Architect, J. G. Price, Holden Bldg. General contractors, Clark & Kayer, 5400 Prince Edward street.

Toronto, Ont.

Addition to factory, cost $12,000, Dufferin street, for Metallic Roofing Co., King and Dufferin. Architects, Curry & Sparling, 105 Bond street. General contractors, Chas. W. Wood & Son, 611 Manning. Two storeys, 72 x 98, brick construction and foundation.

Two stores and apartments, cost $13,000, for Geo. Kerr, care architects, Symons & Rae, 15 Toronto street. Mason, E. Blaise, 89 St. Clarens. Three stys., 99 x 32, brick construction, concrete. Foundations in.

Warehouse, cost $65,000, 433 King W., for Samuel Benjamin Co., King and Spadina ave. Architects, Burke, Horwood & White, 28 Toronto street. Masonry, Holtby Bros., 61 Hepbourne. Six stys., 50 x 121, structural steel and brick construction, stone and brick foundation. Foundations started.

Express office, cost $6,500, Parkdale, for Canadian Pacific Railway Co., Union Station. Builder, J. C. Hayman & Sons, 4 Bain ave. One storey, 22 x 46, structural steel and brick construction, cement foundation.

Victoria, B.C.

Warehouse, cost $30,000, for Scott & Peden, 1406 Store street. Architect, M. S. Farmoll, 415 Sayward Bldg. General contractors, Martin Jones. Otis Fensom Elevator Co., supplying the elevator.

Windsor, Ont.

Alterations to hotel, cost $7,000, Aylmer, for J. E. Peters. Architect, Clare Williamston. General contractors, Williamston Construction Co. One storey addition, brick construction.

Residences

Hamilton, Ont.

Residence, cost $10,000, Main St. E., for Walter Stewart, care architects, Stewart & Witton, 7 Hughson S. Two storeys and basement, pressed brick construction, cement foundation. Plans in progress.

Montreal, Que.

Four flats, cost $9,000, Delinelle, for Beaupre & Fils, 597 St. Paul street. Architects, MacDuff & Lemieux, St. Catherine St. W., have prepared plans. Two storeys, 50 x 66.

Six flats, cost $16,000, Outremont, for H. Fortier, 2478 Hutchison. Tenders will be called shortly by owner for plumbing, roofing and electrical work. Three storeys, 50 x 74, stone foundation and construction.

Residence, cost $12,000, Gouin Blvd., for Hector Paiemont, 128 St. Peter St. Architects, Keith's, Minneapolis, Minn., have prepared plans. Two storeys, 46 x 40.

Six flats, cost $9,000, Wilson, planned for J. H. Hand, 609 Belmont ave. Architects, Wright & Son, 204 St. James street. Two storeys, 80 x 65, cement foundation.

Five 3-storey flats, cost $15,000, Rivard, for Nap. Deslauriers, 406 Sherbrooke street. Architect, Chas. Bernier, 70 St. James street. Three storeys, 40 x 100, brick, concrete foundation. Plans drawn.

Flats, cost $25,000, St. Laurent. Architect and builder, Gilbert Demers, 1215 St. Denis. Owner is not sure whether he will call tenders or do work by day labor. Four storeys, brick, cement foundation.

Residence, cost $8,000, Outremont. Builders, British Construction Co., 238 St. James street, will receive tenders for heating, plumbing, electrical work and roofing. 2½ storeys, 24 x 40. Stone foundation, solid brick construction.

Medicine Hat, Alta.

Apartments, cost $35,000, for Mr. Metyner, c/o architect, Hugh A. E. Browne, Becker Block, Main street, is preparing plans.

North Battleford, Sask.

Apartment block, cost $11,000, King street, for N. H. Butler. Architects, Stephenson, Evans & Fillingham, Main street. Two storeys, 32 x 90, frame construction. Contract for superstructure not awarded yet.

Apartment block, cost $7,000, Edward street, for J. Baxter. Architects, Stephenson, Evans & Fillingham. 32 x 110 concrete foundation, frame construction. Plans drawn.

Toronto, Ont.

Two apartment houses planned by Alex. Ballantyne, 690 Gladstone ave. Tenders received by owner for all trades.

One detached residence, cost $5,500, Belsize Drive, for A. G. C. Dinnick, 57 Victoria street. Architect, Allen George, 67 Victoria street. 2½ storeys, 25 x 36, brick construction and foundation. Plans drawn.

Twenty houses planned by Grimshaw Bros., 24 Brockmount Road. Tenders received for labor only. Stone work on 12 houses, brick work on 8 houses.

Residence, cost $8,000, Blythewood Rd., for J. H. Young, 64 Wellington W. Architect, A. S. Carter, 34 North Street. 2½ storeys, 24 x 42, brick construction, cement foundation. Plans drawn.

Residence, cost $30,000, Russell Hill Rd. and Heath Street, for H. C. Tomlin, 418 Bathurst street. Structural steel, brick and stone construction, stone foundation. Plans in progress.

One detached residence, cost $3,000, for Geo. H. McLaughlin, 54 Hogarth. Architect, P. H. Finney, 79 Adelaide E. 2½ storeys, 32 x 36, brick construction and foundation. Plans drawn.

Vancouver, B.C.

Apartment, cost $110,000, Robson St. Architects, Evans & Sons, Inns of Court Bldg. Four storeys, brick facing, stone trimming. Plans drawn.

Winnipeg, Man.

Two residences, cost $65,000, planned, Strathcona, for F. J. McGreevy, 120 Phoenix Block. Two storeys, 20 x 26, frame, stone foundation.

Residence, cost $5,000, for H. Hirsch,

291 Manitoba ave. One storey, 28 x 50, brick, cement foundation. Plans ready.

Two residences, cost $7,000, McMillan ave., for A. J. Anderson, 235 Lenore St. Two storeys, 24 x 28, frame, stone foundation. Plans ready.

In accordance with the recommendation of the Hospital Commission, $10,000 will be appropriated for residence for Medical Superintendent.

Windsor, Ont.

Eight-family apartment is under contemplation by D. M. Eagle. Plans will be prepared.

CONTRACTS AWARDED

Brockville, Ont.

Residence, cost $5,000, Ford street, for F. Kilpatrick. General contractor, N. E. Brown. Two storeys, 32 x 28, brick construction, stone foundation.

Hamilton, Ont.

Residence, cost $5,200, Melrose ave., for R. Linklater, 72 Erie ave. General contractor, G. J. White, 165 Main St. E. Brick construction. Foundations in.

Residence, cost $7,000, York street, for Wm. Langhorn, Brunswick Hotel. Architects, Munro & Mead, Chancery Chambers. General contractor, Wm. M. Findlay, 317 Aberdeen ave. 2½ storeys, 34 x 40.

Montreal, Que.

Eight flats, cost $9,000, Messier. Owner and builder, Philip Massicotte, 1253a Messier Street, St. John. Three storeys, 50 x 38, felt and gravel roofing. Foundations in.

Nine flats, cost $7,500. Owner and builder, Leon Lavoie, 1301 Chapleau. Three storeys, 42 x 50, concrete foundation, felt and gravel roofing.

Cottage, cost $15,000, Outremont, for I. Lalonde, Hotelkeeper, St. James and Atwater. Builder, W. Tardif, 89 Adam. Two storeys and basement, 25 x 50, brick, concrete foundation.

Five flats, cost $8,000. Owner and builder, Jos. Besner, 356 Prudhomme, Notre Dame de Grace. Three storeys, 25 x 90, cement foundation, felt and gravel roofing. Foundations in.

Four flats, cost $9,000, Melrose. Builders and architects, Holmes Ltd., 357 St. Catherine W. Two storeys, 39 x 65, felt and gravel roofing. Foundations in.

Residence, cost $5,000, Addington, for J. Geo. Pelletier. Builder, Em. Houle, 1511 St. Denis. Two storeys, 25 x 40, stone foundation.
ing started.

Residence, cost $21,000, Westmount (Sydenham ave.), for O. E. Belcourt, 4371 Montrose ave. Builder, J. H. Hutchison, 64 St. Ambroise street, Montreal. Two storeys.

Nine flats, cost $18,000, Outremont. Owner and builder, W. Charbonneau, 124 St. Zotique. Three storeys, 21 ft. 6 in. x 70 ft., stone foundation, pressed brick construction.

Residence, cost $8,000, Outremont, for T. Latourelle, 221 Outremont ave. General contractor, M. Boucher, 224 Berri street. Heating and plumbing, owner. 2½ storeys, 20 ft. 6 in. x 63 ft.

[illegible] for D. L. Crawford, c/o Cradock Simpson Co. Builder and general contractor, Geo. Goodbody, 549 Durocher. General contractor does his own work. Two storeys, 28 x 40, cement foundation, brick construction.

Three flats, cost $12,000, Outremont (Querbes), for E. E. Snowdon, 302 Laval ave. Builders, Jno. Shaw & Son, 2524 Esplanade. Three storeys, 22 x 60, brick, concrete foundation.

Four flats, cost $24,000, Victoria. Architect and builder, W. H. Creed, 686 Roslyn ave. Owner may call tenders later for electric lighting, heating and plumbing. Two storeys, 18 x 62, concrete foundation, brick construction, hardwood floors. Excavating started.

Four flats, cost $16,000, Old Orchard N.D.G. Owner and builder, A. M. Irvine, 507 Grosvenor, Westmount. 2½ storeys, 50 x 38, felt and gravel roofing. Foundations in.

Residence, cost $6,000, Outremont. Owner and builder, A. Lemire, Sault aux Recollet. Two storeys, 26 x 40, pressed brick construction, stone foundation.

Residence, cost $24,000, Comte. Owner and general contractor, A. P. S. Glassco, 400 Read Bldg. Architect, A. Hogle & Davis, 80 St Francois Xavier. General contractor does all but plumbing, also electric wiring and tiling tenders are in and will be given shortly. Three stys., 25 x 70.

Flats, cost $8,000, St. James, for C. Drapeau, 121 Addington. Builder, W. Dalphy, 121 Addington. Owner will give electrical contract later. Three storeys, 26 x 30, brick construction.

One detached residence, cost $11,000, Westmount (Wood ave.), for J. J. Laferme, 42 Beaver Hall Hill. Builder, F. M. Hartman, 17 Guy Block. Three storeys, brick and terra cotta construction, cement foundation.

Ottawa, Ont.

Residence, cost $6,000, Cumberland, for H. Parker. General contractors, Geo. Eaman & Son, 297 1st ave. 27 x 34, brick construction, stone foundation.

Residence, cost $5,000. Owner and general contractor, R. Young, 221 Mutchmore. 34 x 26, 27 x 15, brick construction, stone foundation.

Point Grey, B.C.

Residence, cost $16,000 (Shaughnessy Heights), for Hugh MacLean, 543 Hastings West. Architects, Grant, Henderson & Cook, 413 Granville street, Vancouver. General contractor, S. B. Abernethy, 517 Broadway West, Van. Two storeys, frame construction.

Residence, cost $11,000, Shaughnessy Heights, for H. H. McDougall, 509 Winch Bldg., Vancouver. Architects, Grant, Henderson & Cook. General contractor, H. P. Leek, West Point Grey, P.O. Two storeys, frame construction.

Residence, cost $25,000, for D. M. Stewart. Architects, McKenzie & Ker, 330 Homer street. General contractor, R. Band, 2377 5th ave. west. 2½ storeys, [illegible]

Quebec, Que.

[illegible] ave., for Hon. Geo. Elie Amyot. Builder and general contractor, R. G. Sharp, Montreal. [illegible] steel construction. Excavating started.

Residence, cost $10,000. Builder and general contractor, Delphis Roy, 93 [illegible] 45, stone foundation, tile & wood construction.

St. John, N.B.

Residence, cost $6,000, West, for Dr. F. H. Neve, Architect, Garnet Wilson, 50 Princess street, has prepared plans. Work being done by day labor.

Toronto, Ont.

Residence, cost $7,500, Alexandra Blvd. for Herb. Begg, 121 Admiral Road, will sublet some trades. Two storeys, 26 x 36; brick construction.

Detached residence, $9,000, Park Rd., for D. S. Woods, c/o architects, Page & Warrington, Confederation Life Bldg. Builder, L. Price, 33 Munro Park ave. Two storeys, 3½ x 3; brick construction and foundation.

Two residences, cost $9,500, Lonsdale, for J. R. Marshall, 601 Parliament street. Architect, J. Hunt Stanford, Bloor and Ossington. Mason, Wm. Scringour, 218 Close ave. Carpenter, owner. Plasterer, J. Petrie, 353½ Dupont street. 2½ stys., 26 x 37, brick construction, stone foundation.

One detached residence, cost $4,900, Pleasant Blvd. Owners and builders, Shaw Bros., 521 Manning ave. 2½ stys., 22 x 36, brick construction, stone foundation.

Apartment house, 6 Howard street, for J. M. Chalmers, 644 Ontario street. Architect, J. H. Stanford, 644 Ontario street. Architect, J. H. Stanford, Bloor and Ossington. General contractors, Chalmers Bros., 6 Howard street. Tenders received for plumbing.

Winnipeg, Man.

Residence, cost $22,500, Harrow and Harvard, for C. W. Rowley, c/o Canadian Bank of Commerce. Architect, R. G. Hanford, Carlton Bldg. General contractor, S. M. Waldron & Co., 507 McIntyre Bldg. Electrical work, Prior Elec. Co., 627 Ellice ave. 2½ storeys, 55 x 37.

Residence, cost $6,000, Jerrie avenue. Architect and general contractor, P. McDiarmid, 373 Furby street. Two stys. 20 x 28, stone foundation, frame construction. Excavating started.

Three residences, cost $8,000 each, Dorchester street and 23 cost $7,500 each. Architects and builders, West End Realty & Building Company, Portage avenue and St. James street. 2½ storeys, stone foundation.

Residence, cost $10,000, Machray ave., for J. Harrison, 960 Main street. Architect and builder, J. J. Spain, 139 Machray ave. 2½ storeys, 34 x 34, brick construction, stone foundation. Excavating started.

Residence, cost $22,500, Harrow and Harvard streets, for C. W. Rowley, c/o Canadian Bank of Commerce. Architect, R. G. Hanford, Builders' Exchange Bldg. General contractors, S. M. Waldron & Co., 507 McIntyre Block. 2½ storeys, 36 x 36, stone foundation, brick veneer construction. Excavating started.

Residence, cost $25,000, Main street & Bannerman ave., for The Merchants Bank of Canada. Architect, John D. Atchison, Trust & Loan Bldg., Portage ave. east. General contractors, G. A. Fuller & Co., 1001 Union Bank Bldg. Two storeys, 31 x 64, pressed brick and terra cotta construction.

Four residences, cost $16,000, Mach

(Continued on page [illegible])

Tenders and For Sale Department

Sealed Tenders

[illegible] received up to **Monday**, [illegible] **June 19th, 1913**, for the construction of [illegible] feet, more or less, Cement Concrete Sidewalks in the Village of New Hamburg. Particulars can be had by applying to [illegible]

I. F. KATBENMEIR,
Clerk.

[illegible]

Tenders for Highway Bridges

[illegible] marked "Tender for Steel Bridges," will be received by the undersigned up to 9 p.m. on **Saturday, June 14th, 1913**, for the construction and erection of two low truss, box chord steel highway bridges in the County of Peel. The spans being respectively 40 feet and [illegible]

A form of tender and all information may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHEELOCK,
County Engineer,
Orangeville, Ont.

Orangeville, May 28, 1913. 23-24

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Collingwood, Ont.," will be received at this office until 4 p.m. on **Monday, June 23, 1913**, for the construction of a Public Building at Collingwood, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. Philip C. Palin, architect, Collingwood, Ont., at the office of Mr. Thos. A. Hastings, Clerk of Works, postal station "F," cor. Yonge and Charles streets, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—39678. 23-24

Sealed tenders addressed to the undersigned and endorsed "Tender for Postal Station "G," Toronto, Ont.," will be received at this office until 4 p.m. on **Wednesday, June 25, 1913**, for the construction of the building mentioned.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. E. J. Lennox, Architect, 164 Bay street, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 2, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40090. 23-24

Tenders for Construction of Bloor Street Viaduct in Reinforced Concrete

Those desiring to submit tenders on reinforced concrete construction for Bloor Street Viaduct, are hereby notified that they may prepare and submit, without any expense, whatsoever to the City, their own plans and specifications, and may tender on same.

These tenders will be received at the same time as those for the steel design.

Tenderers for a reinforced concrete structure will be required to guarantee the safety of same for a period of five years from date of completion, and shall state in their tenders, the form and amount of such guarantee.

Surveys, boring records, conditions at the site and other necessary information in the possession of the Works Department will be furnished, without fee, upon request.

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relating to tendering, as prescribed by City By-law No. 4294, must be strictly complied with.

Tenderers shall submit with their tenders, the names of two personal sureties approved by the City Treasurer, or in lieu thereof, the bond of a guarantee company satisfactory to the City Treasurer.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor.
Chairman, Board of Control.

City Hall, Toronto,
May 20th, 1913. 23-24

CONTRACTORS

Why don't you try this new firm for quick delivery of supplies. The International Supply & Construction Co., Ltd., Hull, Que. 21-24

Tenders for Pavements

CITY OF BERLIN

Sealed tenders, addressed to A. H. Millar, City Clerk, will be received up to 5 o'clock p.m., **June 12, 1913**, for approximately 8,400 square yards of Asphalt or Bitulithic Pavement; approximately 6,400 square yards of vitrified brick street car track allowance and 6,800 lineal feet of curb and gutter.

Plans and specifications may be seen at the office of the City Engineer after May 30.

The lowest or any tender not necessarily accepted.

HERBERT JOHNSTON,
City Engineer.

22-24

TENDERS

Tenders will be received by the undersigned till noon on **Friday, June 20th**, in bulk or separately, for the following departments in connection with the Hudson's Bay Company's Departmental Store, Vancouver, B.C.

- Steam-Fitting.
- Electric Wiring.
- Plumbing.
- Refrigeration.
- Vacuum Cleaning.
- Sprinklers.
- Steam Driven Generating Units.
- Turbine Generating Units.
- Steel Smoke Stack.
- Suction Ash Conveyor.
- Pneumatic Cash Tubes.

BURKE, HORWOOD & WHITE,
Architects,
28 Toronto Street,
Toronto, Ont.

24

Special Notice

Every m n who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Department of Railways and Canals, Canada

Canadian Government Railways Halifax Ocean Terminals Railway, Halifax, N. S.

Sealed tenders addressed to the undersigned and endorser "Tender for Grading Halifax Harbour Terminals Railway" will be received at this office until twelve o'clock noon of the **21st day of June, 1913**, for the grading of a double track railway from Rockingham to the Halifax Ocean Terminals.

Plans, specifications and form of contract may be seen and full information obtained at the office of the General Manager of Government Railways, Moncton, N.B., at the office of the Engineer at Halifax, N.S., and at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, Ont.

The right is reserved to reject any or all tenders.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, May 30th, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—42797. 24-25

THE PAS, MANITOBA

Sealed tenders, registered and endorsed on the envelope, Tender for (tender bidding on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the Town of The Pas, will be received up to 6 p.m., **July 1st, 1913**, for the supply of the following materials, and the performance of certain works:

Tender A

Supply and delivery of—
3770 ft. of 24-in. Vitrified Sewer Pipe.
5470 ft. of 20-in. Vitrified Sewer Pipe.
2000 ft. of 18-in. Vitrified Sewer Pipe.
600 ft. of 15-in. Vitrified Sewer Pipe.
1200 ft. of 6-in. Vitrified Sewer Pipe.
Excavating and laying and construction of Manholes, Catch Basins, Flush Tanks, etc.

Tender B

Trenching and laying of approximately—
4400 ft. of 12- in. steel pipe.
3500 ft. of 10-in. steel pipe.
4400 ft. of 8-in. steel pipe.
2000 ft. of 6-in. steel pipe.
Setting Valves, Hydrants, etc., and back filling.

Tender C

For the erection of Power House.

Tender D

For the erection of Pole Line.

Tender E

For the supply, delivery and erection of Motors, Pumps, Piping, and Air Compressor.

Tender F

For the supply and delivery of Poles, Wires, Line material, etc.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved surety company. The lowest or any tender not necessarily accepted.

The tender forms must be filled in—copies of which are attached to the specifications, or are obtainable at the office of the Consulting Engineers.

Plans and specifications may be seen at the office of the Consulting Engineers, The Canadian Engineer, 820 Union Bank Bldg., Winnipeg, and at the resident engineer's office, The Pas, Man., or a complete set of plans and specifications for any contract will be given or forwarded on a deposit of Twenty-five ($25) Dollars, and a set [illegible] posit of One Hundred ($100) [illegible]. The deposit cheque will be returned if plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D.,
[illegible]
The Pas, Man.

MURPHY & UNDERWOOD
Consulting Engineers,
23-26 Ross Block, Saskatoon, Sask.

Notice to Contractors

Time for receiving tenders for construction of Dining Hall Building, to be erected on the grounds of the Ontario Agricultural College, Guelph, is extended to **Monday, the 16th of June, 1913.**

By order,

H. F. McNAUGHTEN,
Secretary.
Department of Public Works, Ontario,
Toronto, June 5th, 1913. 24

Extension of Time

Notice is hereby given that the time for receiving tenders for Dredging at Collingwood, Ont., is extended to **Thursday, June 19, 1913.**

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 4, 1913. 24

Tenders for Construction of Sewer

Sealed tenders, plainly marked as to contents, will be received at the office of the undersigned up to noon of **Saturday, June 14th, 1913**, for the construction of a sewer on Russell Hill Road, in the Township of York.

Plans and specifications and all information may be obtained at the office of Frank Barber, C. E., 57 Adelaide St. E., Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Township Engineer,
Toronto, June 5th, 1913. 24

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Sudbury, Ont.," will be received at this office until 4 p.m. on **Monday, June 23, 1913**, for the work mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto; at the Post-office, Sudbury, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the [illegible] returned.

The Department does not bind itself to accept [illegible]

By order,

R. C. DESROCHERS,
Secretary.
[illegible]
Ottawa, June 2, 1913

Newspapers will not be paid for this advertisement if they insert it without authority from the [illegible] 24-25

Sealed tenders addressed to the undersigned, and endorsed "Tender for Interior Fittings, Post Office, Paris, Ont.," will be received until 4 p.m. on **Thursday, June 19, 1913**, for the work mentioned.

Tenders will not be considered unless made upon forms supplied by Department and in accordance with conditions contained therein.

Plans and specifications to be seen on application to Mr. Geo. W. Wheeler, Clerk of Works, Paris, Mr. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, and at the Department of Public Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
—42311. Ottawa, June 5, 1913.
24

Tenders for Refrigerator Plant for the Municipal Hospitals

Sealed tenders, addressed to the Chairman, Board of Control, will be received at the office of the undersigned up to **11** a.m. on **Friday, June 20th, 1913**, for the supply and installation of all machinery, plant and piping necessary for the Refrigerator Plant at the Municipal Hospitals, Winnipeg.

Plans, specification and form of tender, together with conditions governing tenders as prescribed by By-law may be obtained on application to the Secretary of the Municipal Hospital Commission, Morley Avenue, Winnipeg.

The lowest or any tender not necessarily accepted.

M. PETERSON, Secretary.
Board of Control Office,
Winnipeg, May 30th, 1913. 24

Intercepting Sewer Extension

CITY OF SASKATOON

Sealed tenders, addressed to the City Commissioners, Saskatoon, Sask., and endorsed "Tender for Intercepting Sewer," will be received until 12 o'clock noon, **Friday, June 20th, 1913**, for the construction, including all material and all labor, of the following work:

3,400 lineal feet of earth excavation and building 36-inch reinforced Concrete Pipe Sewer.

2,478 lineal feet of earth excavation and build[illegible]

[illegible]

[illegible] George T. Clark, City Engineer, Saskatoon, or [illegible] returned with tender.

[illegible] cepted.

[illegible]

[illegible] 24-25

Tenders for Dredging

[illegible] the undersigned, [illegible] Dredging, Port Arthur, Ontario," will be received until 4 p.m., on **Friday, June 13, 1913**, for the dredging required at [illegible]

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, De[illegible] Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order.

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 31, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42848. 23-24

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Shelburne, Ont.," will be received at this office until 4 p.m. on **Monday, June 30, 1913**, for the construction of a Public Building, at Shelburne, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of Mr. J. M. Vance, K.C., Shelburne, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, postal station "F," Cor. Yonge and Charles Sts., Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be [illegible]

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering declines to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept [illegible]

By order.

R. C. DESROCHERS,
Secretary.

Department of Public Works,
[illegible]

Newspapers will not be paid for this advertisement if they insert it without authority from [illegible] 24-25

Department of the Naval Service

Tenders for Masts and Buildings for Wireless Telegraph Stations

to be erected at

Kingston, Ont. Toronto Island, Ont. Port Burwell, Ont.

Sealed tenders addressed to the undersigned, and endorsed "Tender for the erection of Masts and Buildings for Wireless Telegraph Stations," will be received at this office until noon on **Wednesday, June 25th, 1913.**

Plans and specification and form of contract to be entered into, can be seen on and after the 10th instant, at the office of the General Superintendent of the Wireless Service, Department of the Naval Service, Ottawa, or at the offices of the

Post Master, Kingston, Ontario.
Harbour Master, Toronto, Ontario.
Post Master, Port Burwell, Ontario.

Contractors are at liberty to submit tenders for any or all of the masts or buildings for any of the above stations, but a separate tender must be forwarded for each set of masts and for each set of buildings tendered on. In addition to the **above, contractors may, if they so desire, submit a** tender for the three complete sets of masts and a tender for the three complete sets of buildings.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of the Naval Service, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the contract. If the tender be not accepted the cheque will be returned.

By order,

G. J. DESBARATS,
Deputy Minister.

Department of the Naval Service.
—43176. Ottawa, June 5, 1913. 24

Piles For Sale

A carload of piles 30 to 40 ft. in length not needed on present. Will sell lot cheap.

BISHOP & BUCHANNAN,
24-27 Owen Sound, Ont.

For Sale

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

For Sale

1 Scow, 15 x 30 ft., nearly new.
1 Anchor, 400 lbs.
1 Anchor, 300 lbs.
3 Anchors, 200 lbs. each.
2 Sling Chains, 25 ft. long.
1 set Deferential Blocks complete.
1 pair of Shear legs.
1—12-in. Lead Pot (for melting).
1 Diaphram Pump (for drains).
1—5-in. Centrifugal Pump.
1 Tool Truck.
25 Drain Stays, 2 ft. 6 in.

Apply to McQuillan & Company,
1457 Queen Street West,
23-25 Toronto, Ont.

For Sale

Large deposit of a fine grained massive trap rock. Trap is of the very best quality for road work. Can be very cheaply quarried. Railroad runs right through the property. Freight rates reasonable. Apply S. A. Wookey, c/o British American Hotel, Kingston, Ont. 24-26

For Sale

One No. 1 Marsh-Capron Rail-Track Concrete Mixer, with Trucks, Steam Engine and Boiler, elevating Side-Loader and automatic Measuring Tank. Capacity, 9 cu. ft. of mixed concrete.

This is a first-class machine and has never been used. Will be sold at a bargain as the owner does not now require it.

Apply to Box 801, Contract Record, Toronto, Ont. 23-26

BARGAINS!

All Steel Drag Line, Lidgerwood, Class B. with 1½ yd. and 1 yd. buckets, 60 ft. boom; A.1.	$3,200
No. 0 Thew Steam Shovel, used less than 90 days, shop No. 690, practically new.	3,300
30 1¼ yd. end dump cars, 36 in. gauge, practically new, each	30
1 American Well Works Air Compressor, 12 x 12 x 14, 340 ft. capacity, new	440
1 Rand Belted Compressor, 10 x 14, A.1.	240
1 Austin No. 0 Trenching Machine, used 1½ years, thoroughly overhauled	2,700

THAT'S NOT ALL

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

Situations Wanted

Superintendent, disengaged May 31st. Factories, Varnish, Paper Mills, Supervision and erection. Prepare own plans and estimates. Box 808, Contract Record, Toronto, Ont. 23-24

DO YOU NEED HELP?

For construction work; Sewer, Bridge Work. We furnish skilled and unskilled labor for all kinds of work.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
Phone Ade. 3919. 24-25

Situations Vacant

WANTED — A good general Architectural Draughtsman, steady position to the right man. Apply by letter stating salary expected, etc. Philip C. Palin, Architect, Collingwood, Ont. 24-25

Residences

(Continued from page 81)

ray ave. Owners and builders, Cohen & Meyerowitz, 683 Alfred ave. Two stys., 22 x 28, stone foundation, frame construction. Excavating started.

Five residences, cost $20,000. Architect and general contractor, B. Chisholm, 393 Union street. Two storeys, 24 x 28, stone foundation, frame construction.

Residence, cost $9,000, Oxford. Owner and general contractor, J. H. G. Morgan, 641 Maryland. Two storeys, 28 x 44, frame, cement foundation.

Residence, cost $22,500, Harrow and Harvard, for Chas. W. Rowley, c/o Bank of Commerce. General contractors S. M. Waldron & Co., 507 McIntyre Bldg. 2½-storeys, 55 x 37.

Residence, cost $8,000, Oxford street. Owner and general contractor, H. G. Morgan, 641 Maryland. Two storeys, 28 x 36, stone foundation, frame construction.

Four residences, cost $12,000. Owner and builder, J. W. Alderson, 302 Lipton street. Two storeys, 20 x 28, stone foundation, frame construction. Excavating started.

Six residences, cost $21,000, Bannatyne ave. Owners and builders, B. Robinson & Co., 654 Mountain ave. Two storeys, 24 x 30, stone foundation, frame construction.

Residence, cost $8,700, Montrose. ave. Owner and general contractor, F. W. Walker, 187 Harvard. 2½ storeys, 32 x 32, stone foundation, frame construction.

Residence, cost $13,000, Yale ave. Owner and general contractor, F. W. Walker, 187 Harvard. 2½ storeys, 34 x 35 ft. 6 in. brick veneer construction, stone foundation. Excavation done.

Two residences, cost $10,000, Grosvenor. Owner and builders, West End Realty & Building Co., 818 Sterling Bank Building, 2½ storeys, 20 x 28, frame, cement foundation. Excavating started.

Residence, Yale and Harrow, for A. E. Grassby, 295 Portage ave. Architects, Jordon & Over, 47 Canada Life Bldg. General contractors, Winnipeg Stone Co., Georgina and Levee, Elmwood. 2½ storeys and basement, 40 x 40, stone foundation, brick veneer and tile construction.

Nineteen residences, cost $95,000, Weseley, Owners and builders, West End Realty & Building Co., 818 Sterling Bank Bldg. 2½ storeys, 26 x 29, frame stone foundation. Excavating started.

Three residences, cost $15,000, Dorchester. Owners and builders, West End Realty & Building Co., 818 Sterling Bank Building. 2½ storeys, 20 x 28, frame, stone foundation. Excavating started.

Apartment block. General contractors, Kindt Bros., Henry and Park streets. Architect, P. C. Samwell, Builders' Exchange Bldg. Three storeys and basement, 33 ft. 5 in. x 68 ft., brick, stone foundation.

Seven residences, cost $35,000. Owners and builders, West End Realty & Building Co., 818 Sterling Bank Bldg. 2½ storeys, 26 x 29, frame, stone foundation. Excavating started.

Residence, cost $8,000, St. Charles. for Wm. Brown, c/o architect and general contractor, E. G. Sherwood, Commonwealth Block. 2½ storeys and basement, brick veneer construction, stone foundation.

Power Plants, Electricity and Telephones

Kamloops, B.C.

[illegible] in erecting hydro-electric power plant, [illegible] tem. Clerk, J. J. Carment

Montreal, Que.

Cedar telephone poles, required by Horace Hartley, 19 Major street. 1,000 poles 25 ft. x 6-in. tops; 500 poles 25 ft. x 7-in. tops. 1,000 poles 30 ft. x 7-in. tops. 1,000 poles 35 ft. x 7-in. tops. 400 poles 40 ft. x 7-in. tops. State price, quantity and date of delivery.

Prince Albert, Sask.

Power plant. Plans being prepared for modern steam generating station. Condensing steam turbines, connected to a.c. alternators, capacity 2,000 kw. each. Boilers to be water type, 5,000 h.p. capacity, equipped with mechanical stokers, fed by up-to-date coal handling machinery. Clerk, C. O. Davidson. Electrical Superintendent, R. Wright.

Russel, Man.

By-law passed to raise $18,000 for erection of electric lighting plant.

St. Thomas, Ont.

St. Thomas Biscuit Company plan to install electrical equipment. Manager, Mr. Noble, will use 150 hp.. and will install galvanized conduits complete for distributing it through factory.

Saskatoon, Sask.

By-law passed to raise $150,000 for extensions to electric lighting and power system. Clerk, Andrew Leslie.

Winnipeg, Man.

Carbons and glassware required by Board of Control for street lighting. Engineer, J. G. Glassco, 54 King street. Specifications at office of engineer. Tenders received by secretary, M. Peterson, till June 26.

Contracts awarded to Canadian General Electric Co. for 13,000 volt electrolytic lightning arrester equipment at $188.50. Contract awarded to Packard Electric Co., Ltd., 402 Donalda Bldg., for 6 transformers at $3,260 for all. Equipment, etc., to be installed. Secretary, M. Peterson. Engineer, J. C. Glassco, 54 King street.

Storage battery building, Mill street, planned by Winnipeg Electric Railway Co., Portage ave. Manager, W. Philips. Structural steel, reinforced concrete and brick construction. Excavating started.

Business Notes

Brantford, Ont.

Livery stable, 259 ColborneSt. Owned by Leslie Anguish, 115 Chatham street. Burned, loss $5,000.

Montreal, Que.

[illegible] owned by H. H. Vachelle Koelle, 59 St. Gabriel street, burned, loss $20,000 Agent, Mr. Koelle, is looking after repairs. Three storeys, 50 x 60.

Quebec, Que.

[illegible] des Commissaires, destroyed by fire Loss $25,000, covered by insurance.

Shoe factory of The James Muir Co., 593 St. Valier, burned. Loss $5,000.

Riviere Jeaune, Que. (Co. Que.)

[illegible] $5,000 insurance. New machinery re[illegible]

Toronto, Ont.

Bakery, Queen E., owned by James [illegible]

Vernon, B.C.

[illegible] ed. Loss about $10,000. Will rebuild.

Woodstock, N.B.

Foundry & machine shop owned by Dunbar & Co., burned, loss $3,500, care Harry Dunbar, Woodstock, N.B. Machinery also damaged. Will re build at once.

New Companies

The Electric Steel and Metal Company, Limited, has been incorporated with a capital of $500,000, to carry on business as an engineering supplies and construction company, railway, civil, mining and electrical engineers, etc., with head office at Welland. The provisional directors are Robert Turnbull, engineer; J. F. Gross, solicitor, and B. J. McCormick, agent, all of Welland.

Sun Investments Limited, incorporated with a capital of $40,000, to erect buildings and deal in building material, with head office at Toronto. The provisional directors are W. O. Jarrett, accountant, O. D. Cadotte, and H. S. Rupert, all of Toronto.

Western Ontario Electric Company, Limited, has been incorporated, with a capital of $25,000, to carry on business as manufacturers and dealers in electrical fixtures and supplies and to carry on a general land and building business, with head office at St. Thomas. The provisional directors are C. A. Branston, C. F. Goodwin, electricians, and A. A. Ingram, barrister, all of St. Thomas.

The Gravel, Sand and Crushed Stone Company, Limited, has been incorporated with a capital of $50,000, to carry on business as dealers in gravel, sand and other building supplies, with head office at Toronto. The provisional directors are John Kerr, L. V. McBrady, barrister, and J. S. McLaughlin, law student, of Toronto.

Hill-Clark-Francis Limited, incorporated, with a capital of $50,000, to carry on business as general contractors and a general land and building company, with head office at New Liskeard. The provisional directors are Leonard Hill, John Clerk and R. F. Francis, contractors, all of New Liskeard.

For Rent—Cottages

[illegible]

Contract Record, Toronto Ont.

WELLER-MADE

Weller Machinery Represents the Highest Quality and Construction Possible

The use of Weller Elevating and Conveying Machinery means reducing the cost of handling materials in manufacturing plants, warehouses and on all kinds of contracting and engineering work. This is proved by the large number of Weller installations and the economy they have effected.

Spiral and Belt Conveyors, Portable Elevators, Dump Cars, Screens, Car Pullers, Car Loaders, Wagon Dumps, Power Shovels, Elevator Buckets, Man Lifts, etc.

Rope Drives, Friction Clutches, Bearings, [illegible], Shaftings, Pulleys, Belting and all other Power Transmitting equipment furnished promptly.

Do not fail to write for our No. 20 catalog.

Weller Mfg. Co., Chicago
New York Office; 50 Church St.

Bearings

Contractors and Builders

Get a

300 to 500 Per Cent Guaranteed Saving

Actual Results Guaranteed or No Sale
Used Wherever Electricity is Available

The
"Hutchinson Combination Woodwooker"

is particularly adapted for the following everyday work in any carpenter shop or building under construction. Cutting Studs, Rafters, Braces, Boring for Dowelling, Tenoning, Dadoing, Pulley Stiles, Window Sills and Door Jambs, Routing, Stair Stringers, Mitreing of any kind, Tool Grinding, etc., and can be set to suit any of these purposes in one minute, and once set will do as much work in an hour as a carpenter will do in a day.

A Portable Woodworker for use wherever wood is to be part of the construction. Allows more work to be done with fewer skilled carpenters. Saves money from the day it starts. Costs only $2 or $3 a month for power.

WRITE FOR CIRCULAR

M. HUTCHINSON
1007 Eastern Ave., Toronto, Ont.

FILE YOUR PLANS

Free of charge at any of the four offices of the

"CONTRACT RECORD"

AND ENGINEERING REVIEW

Contractors and manufacturers of building, municipal, railway, and power plant equipment not only expect to see your tenders advertised in the "Tenders' Department" of the "Contract Record," but they will also find it a great convenience if you place your plans and specifications on file at any or all of our four offices, viz. **Toronto, Montreal, Winnipeg and Vancouver.**

Send along your next Tender Advt. together with Plans and Specifications

CONTRACT RECORD

AND ENGINEERING REVIEW
220 King St. West, TORONTO

MONTREAL
Board of Trade Building

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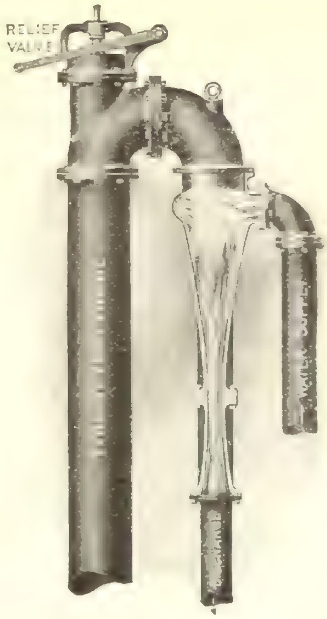
Hutchison Block

Spirojector Condensers



THE BLAKE-KNOWLES SPIROJECTOR CONDENSER

is an improved and highly efficient form of the syphon type of jet condenser that is applicable in nearly every case where a reliable vacuum is to be maintained. It is simple in construction and economical in operation. It is only necessary to locate this condenser at a height of about 34 feet above the overflow of the hot well, in which the lower end of the discharge pipe (sometimes called tail, or leg pipe) is immersed, and it will be readily seen that, as the atmosphere cannot support a column of water in the vertical discharge pipe higher than 34 feet, even with a perfect vacuum above it, any water supplied to the condenser in excess of this 34-foot column will fall through the condenser and out of the discharge pipe by simple gravity. The advantage of not requiring an air pump to take away the water of the condensation, etc., makes this condenser of particular value for situations where types of apparatus depending on air pumps would be undesirable.

For further particulars see Bulletin 880

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.

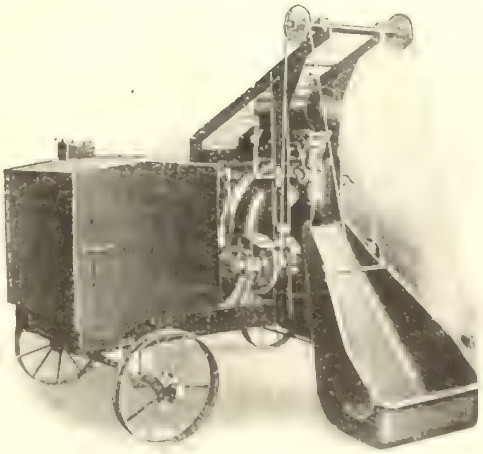
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

On All Classes of Work KOEHRING MIXERS are mixing their way to popularity because of the Dollar Saving Qualities

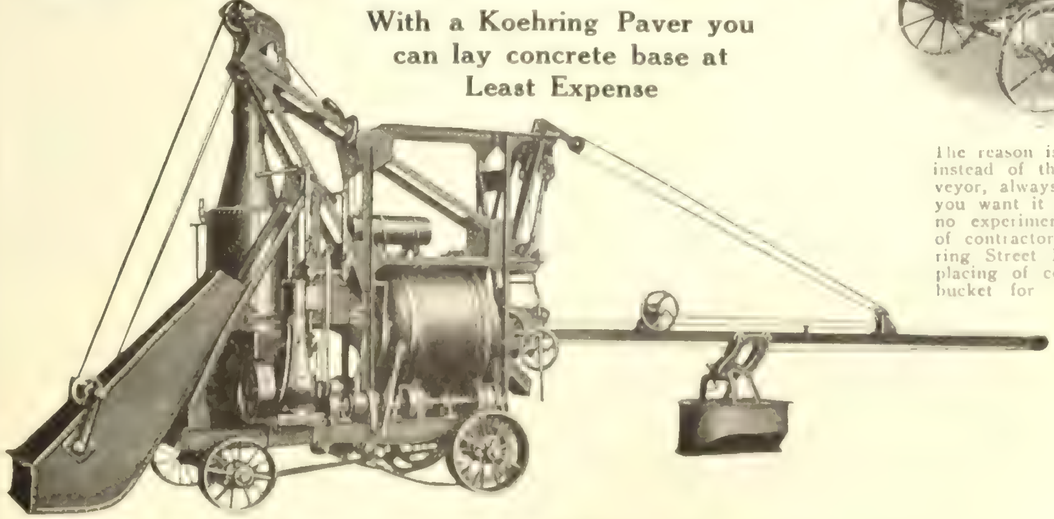
The Koehring 3 in 1 principle of mixing means three times as much mixing or an equal amount of mixing in one-third of the time. There are three independent and opposed mixing actions in the Koehring drum producing thoroughness of mixing and rapidity of mixing and a uniformity of mixing, no other Mixer equals. There are also equally important advantages in the mechanical construction of the Koehring Mixer.

The heavy cast special metal Koehring drum will outlast the drum of any other Mixer. The railroad truck bearing truss and the rollers being keyed on to the axle, makes "wabbly" drums impossible.

The charging bucket raises to a nearly vertical position so that all the material will pass into the drum without pounding the bucket. There are numerous other important features in the Koehring Mixer that you should know about.



With a Koehring Paver you can lay concrete base at Least Expense

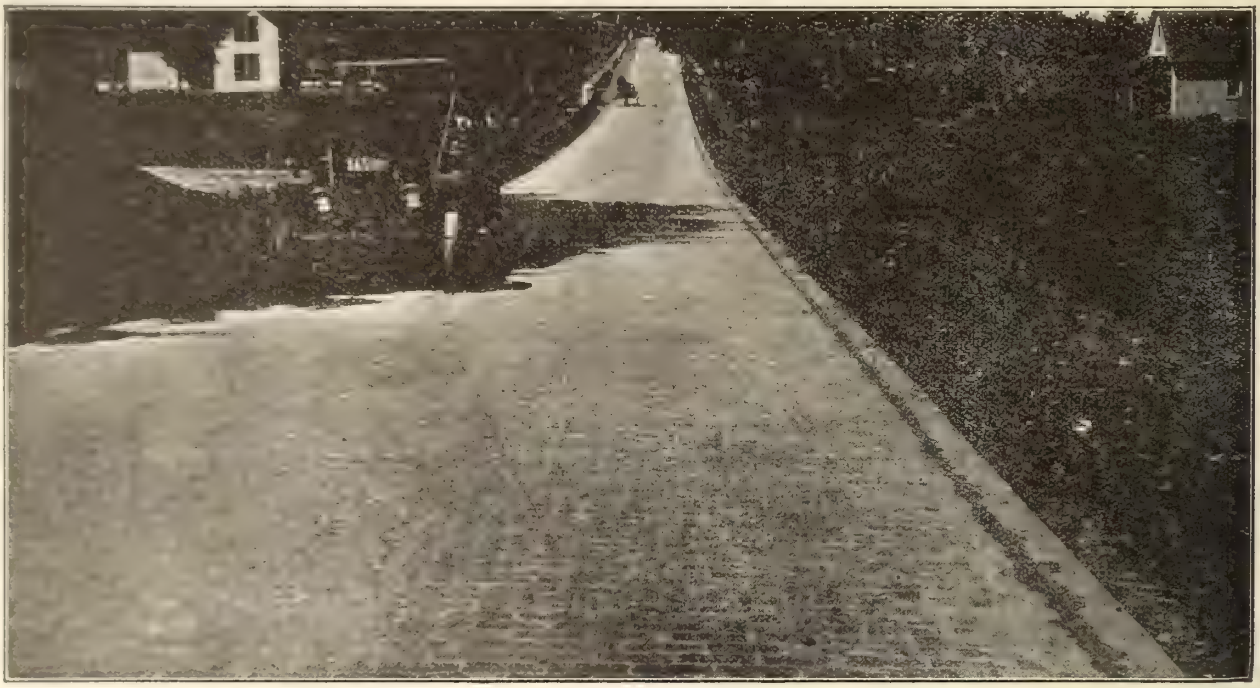


The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds contractors' reputations and pays handsome profits. Aren't you interested in this reputation and [illegible] making?

KOEHRING MACHINE CO., Milwaukee, Wis. Exclusive Sales Agent for Canada: **Canada Foundry Co., Limited**

Toronto Montreal Halifax Ottawa Cobalt Winnipeg Calgary Vancouver Nelson

Wire-Cut-Lug Blocks



No. 3074. Buffalo-Glenwood Road, 21 miles long, New York State Highway, constructed June, 1911. Photo June 8, 1912, at Station No. 369. 13 miles from Buffalo City Line.

There are approximately 100 miles of brick pavement in Western New York in which Wire-Cut-Lug Blocks were used and to these we point with pride.

When you find a brick pavement where the surface is even and the cement grout joints flush with the surface of the brick, you can depend upon it being constructed with Wire-Cut-Lug Blocks. They should be specified and insisted upon in the construction of every brick pavement for city streets and country highways.

Manufacturers, throughout the country who are able to produce a No. 1 paving block are installing our machines for the manufacture of this improved product.

Write us for further evidence

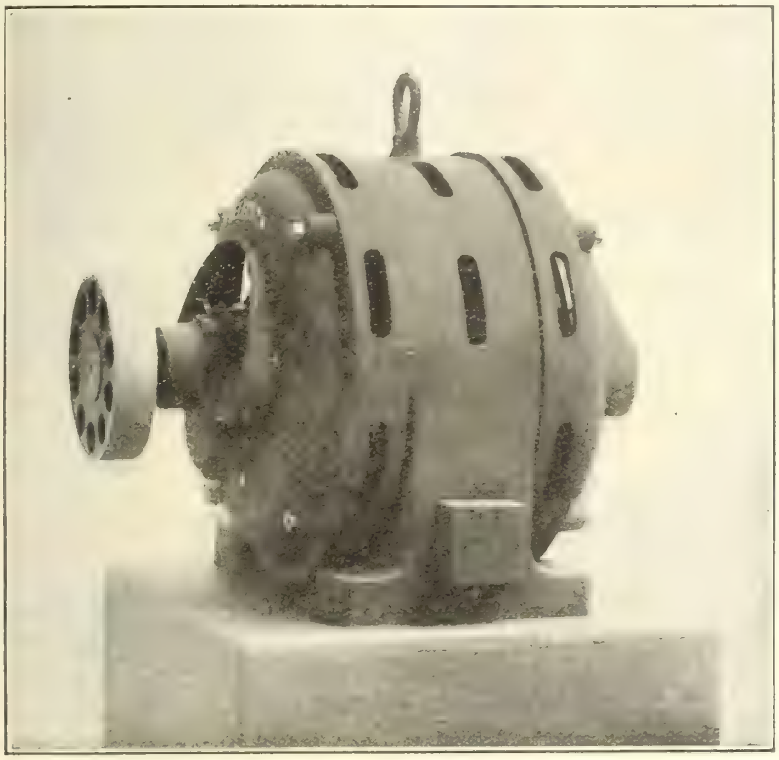
The Dunn Wire-Cut-Lug Brick Company

(LICENSOR)

Conneaut, Ohio

Patented in Canada and other countries

Engineering Works of Canada, Limited



SQUIRREL CAGE MOTOR

Head Offices: New Birks Building,
MONTREAL, QUE.

All kinds of

Mechanical and Electrical Machinery

Builders under the patents of
Societe Alsacienne

ESTABLISHED 1826

Automatic Elevators

Passenger and Freight

Simplicity Foolproof High Efficiency
Patent Single Phase Motor High Starting Torque

WARNING

From a Leading Civil Engineer:

"The number of mistakes made through inadequate provision for Waterproofing, and their costly consequences, running into thousands of dollars, should serve as object-lessons to those who have the design of concrete work in hand and the same degree of attention and study should be given the subject of water tightness as that given to other details of construction."

In the consideration of this subject we direct your attention to CERESIT Waterproofing.

This product when mixed with concrete or cement plaster coating, makes the same uniformly and permanently damp and waterproof.

"Ceresit" Waterproofing

Ceresit is used for waterproofing basements, boiler pits, conduits, culverts, foundations, tunnels, reservoirs, swimming tanks walls, roofs, floors and every sort of construction in which cement enters.

It is Catalogued in "Sweets" Index.

AGENTS WANTED IN UNOCCUPIED TERRITORY

[illegible] & [illegible] Bldg., Toronto, Ont. 8266 pounds of CERESIT used on this building.

CERESIT WATERPROOFING CO.

Commercial Bank Bldg., CHICAGO.

CANADIAN BRANCHES
Douglas Milligan Ltd., 34 University Street, Montreal
W. K. McDonald Co., [illegible] Office Bldg., Toronto
Grace & Walker Ltd., 23 [illegible] St., Winnipeg
E. G. Callan, 118 Pacific Bldg., Vancouver, B.C.
Carritte Paterson Co. Ltd., St. John, N.B.
Carritte Paterson Ltd., Halifax, N.S.

Ceresit Factories are located in Chicago, Unna, Westphalia, Germany, London, Paris, Vienna, Warsaw, Russia.

Please cut this out

REMINDER

to write for Free Book "S" on how to Effectively and Permanently Waterproof Concrete and Cement Mortar.
CERESIT WATERPROOFING CO., Commercial Bank Building, CHICAGO

HOISTING ENGINE REPAIRS

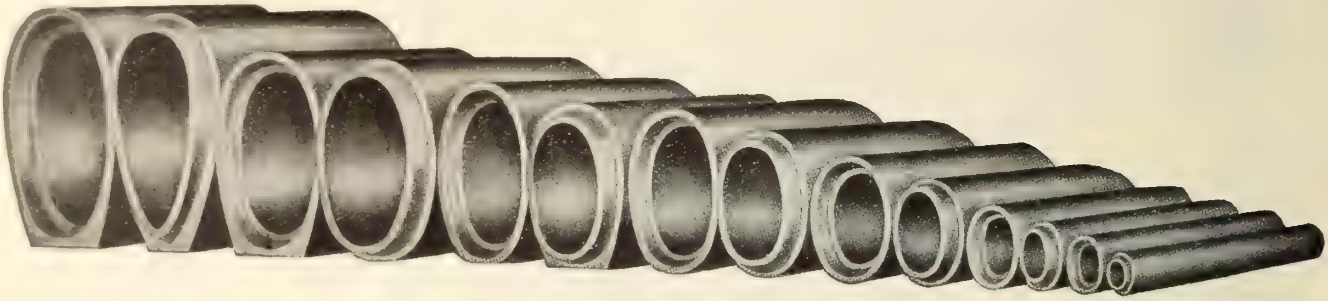
We carry a full line of repair parts for our hoisting machinery at all times. Prompt shipment made on anything you require.

Send for Descriptive Sheet showing Parts and number to order by.

Hoists of all kinds, Winches and Derrick Irons supplied on shortest notice.

SALES AGENTS
MUSSENS
LIMITED
Montreal, Que.

MARSH & HENTHORN LTD.
Makers of Hoisting Machinery, BELLEVILLE, ONT.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.
Kemptville, Ontario

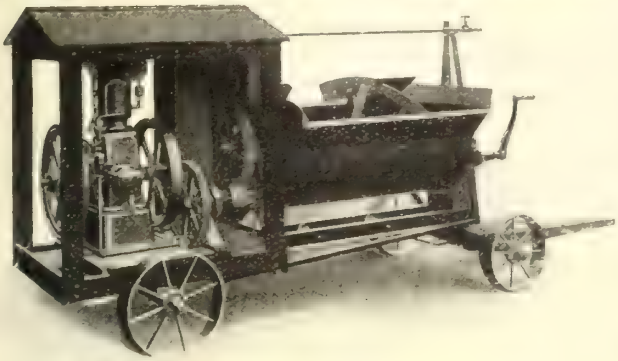
EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited
Galt, Ontario, Can.
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

One Mixer for all Work



The Blystone Mounted Mixer with Power

You will do your concrete mixing quicker and cheaper with the Blystone Mixer. This is not what we alone say but what all users say. This mixer is adaptable to all kinds of work. We are willing to prove its advantages to you—give us the opportunity.

Simple, Durable and ALWAYS READY

Send for Catalogue

The Blystone Machinery Company
60 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
Contractors Department No. 1, TORONTO, CAN.
Sole Distributors for Canada

"Metallic"

Steel Ceilings and Walls

How many kitchens and bathrooms are there in your locality? Every one of them ought to be furnished with "Metallic" Steel Ceilings and Walls; and this certainly offers you a splendid opportunity to get a lot of profitable business.

These fireproof ceilings and walls are inexpensive, are sanitary and easy to clean. You don't have to carry them in stock; our catalogue and price list is all you need. Send for them now.

THE METALLIC ROOFING CO.
OF CANADA LIMITED.
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by
International Marine Signal Co. Limited
Ottawa, Canada

FOR SALE

1—10 x 16 Standard Gauge Porter Locomotive
1—12 x 15 Waterous Slide Valve Engine
1—6 1-2 x 8 American D.C. D.D. Hoist with Swinger
1—7 x 10 Lambert D.D. Hoist
1—10 x 12 Beatty D. C. D.D. Hoist with Swinger
1—5—Ton Tandem Roller
1—20 H.P. Waterous Portable Boiler
1—30 H.P. Locomotive Boiler on Skids
5—Rock Drills
1—No. 2 Smith Concrete Mixer
1—No. 2 Milwaukee Concrete Mixer
1—15 H.P. Upright Boiler

The above machines are but slightly used and are in good working order.

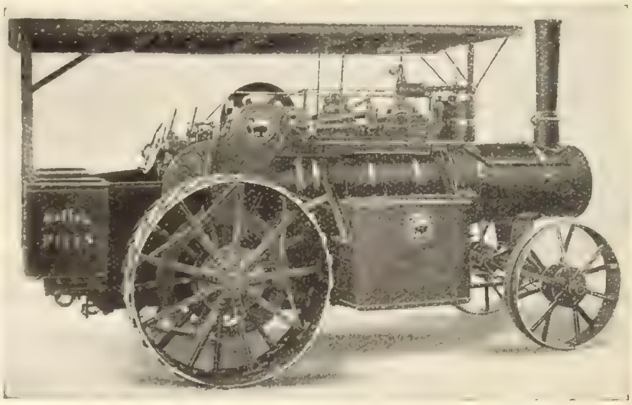
Fleming Machinery Company
340 Sparks Street, Ottawa, Ont.

25% MORE LOAD WITH THE SAME TEAM

You Can Make More Profit if You Pay More Attention to Haulage Cost

Write us about the loads you move and let us send you our proposition without delay

Use Buffalo Pits Co. new Reversible wagons in place of ordinary wagons whether you use horses or other traction power.



Two Speed—Road Locomotive.

New Two-Speed Locomotives—*Light Weight* with *Extra Power*. Flat cleats arranged to give great traction power without cutting roads. Cleats easily removed to secure smooth wheels for use on pavements.

BUFFALO PITTS CO.

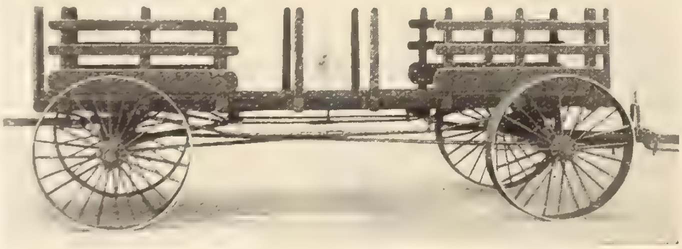
Road Locomotives and Cars.

General Offices: Dept. A, BUFFALO, N.Y.

A NEW TYPE

The only Patent Reversible Gear of its kind, makes the car efficient in places where others are useless. So strong the train will not pull in two. So simple a boy can operate. The greatest time saver of the age. By simply throwing the reversing lever on the connecting hitch the train can be reversed to move either forward or back around the sharpest curves as well as in a straight line. Absolutely the only device where this is possible.

3½ yd. Stone Spreading Type. Also in 6½ yd. to 8 yd. size.



5-Ton Convertible.

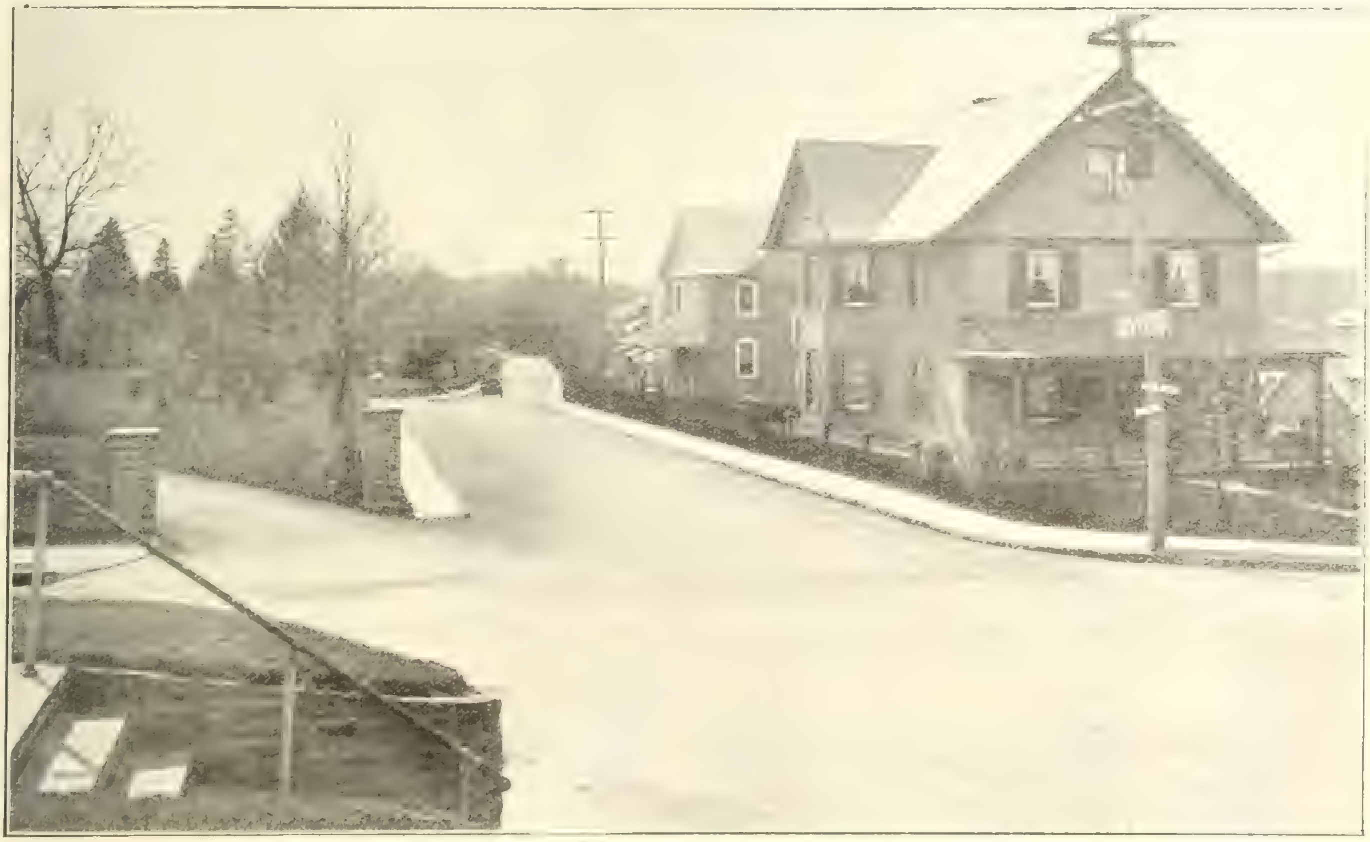
3½ yds. Patent Reversible Car Stone Spreading and Bottom Dump Styles, 5-ton size. Forged Steel Frame, steel wheels with special bronze bushings, special steel axles. 54-inch wheels with 8-inch tires. (Illustrated at left.) 6½ **to 8 yds. 10-Ton** Wooden Frame Car same features of construction as described in 5-ton size. 5-ton Freight Car, Convertible, equipped with different bodies for brick, cement, asphaltum, oil in barrels, pipe, timbers, or any kind of material. Has patent reversible gears.

All types of Buffalo Pitts Co. Cars can be coupled in the same train. Special cars made to order. Write today for full particulars. See address above.

Bermudez Road Asphalt

"IT STAYS PUT"

Washington Lane, Jenkintown, near Philadelphia, Pa. Bermudez penetration 1911



Thousands of Automobiles Use these Roads

Note the wheelmarks of the machines that turn the corners from all directions. There is also considerable heavy hauling at this point. It is the kind of place where, ordinarily, it is impossible to keep the road in even fair condition, owing to the shearing action of the auto wheels.

But this is Bermudez Road Asphalt construction and **"it stays put."**

The road was built in May, 1911, by the penetration method. It has "stood up" through two summers and two winters.

This photograph was made last month. It speaks for itself.

For the construction of all kinds of roads, town streets and park drives as well as country highways—but particularly for heavy traffic roads—Bermudez Road Asphalt is the one "binder" that assures permanency.

Bermudez Road Asphalt is the only lake [illegible] binder. That is the reason why of its stability and long life.

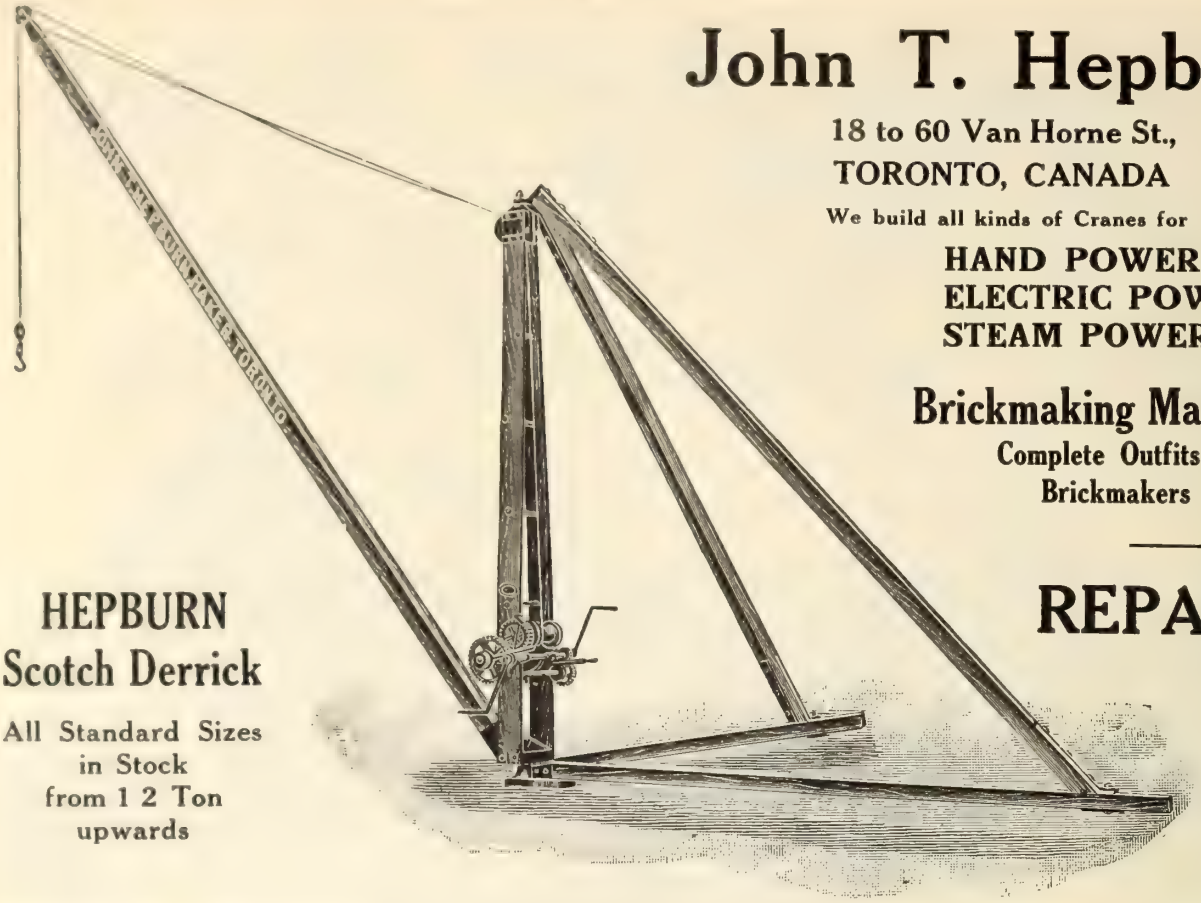
This Company's experience gained in the construction of more than 1,000 miles of Bermudez Asphalt Roads in all sections of the country is at the disposal of anyone interested in real good-road building.

Ask for a copy of the Bermudez Road Book.

ROAD DEPARTMENT

The Barber Asphalt Paving Company

PHILADELPHIA, PENN.


JOHN T. HEPBURN MAKER TORONTO

John T. Hepburn

18 to 60 Van Horne St.,
TORONTO, CANADA

We build all kinds of Cranes for

HAND POWER
ELECTRIC POWER
STEAM POWER

Brickmaking Machinery

Complete Outfits for
Brickmakers

REPAIRS

HEPBURN
Scotch Derrick

All Standard Sizes
in Stock
from 1 2 Ton
upwards

Wooden Water Pipe

Galvanized Wire Wound and Continuous Stave Pipe
for Water Works, Power, Irrigation, etc.

Withstands 250 lb. working pressure.

Not affected by Frost, Corrosion, Electricity or Acid. Water Works Systems installed. Prompt attention to inquiries.

Write for prices.

Manufactured by

Canadian Pipe Co., Limited

P.O. BOX 915

Factory: 550 Pacific St., VANCOUVER, B. C.

Warner-Quinlan Company paving Saint Andre Street, Montreal

Permanent Pavements

To lay a permanent asphalt pavement the material used must be the most refined quality and practically immune to the effects of our erratic Canadian climate—asphalt that will not wave in hot weather or crack in cold weather, always use

Eagle Brand Mexican Asphalt

The accompaning analysis will prove to you the superior quality of Eagle Brand Mexican Asphalt. If you order this grade every barrel of your order will prove this analysis.

ANALYSIS

made by the expert paving chemists
Messrs. DOW & SMITH, New York

[illegible] 99 per cent
[illegible]
chloride 99
[illegible]
[illegible]
[illegible] 44
Ductility [illegible]
[illegible]
[illegible]
[illegible]
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[illegible]
[illegible]

The ASPHALT & SUPPLY CO., LIMITED

Sole Canadian Agents for The Mexican Eagle Oil Co., Limited
([illegible] to S. Pearson & Son, Limited)
TRANSPORTATION BUILDING, MONTREAL

CRUSHED

STONE

PORTLAND

CEMENT

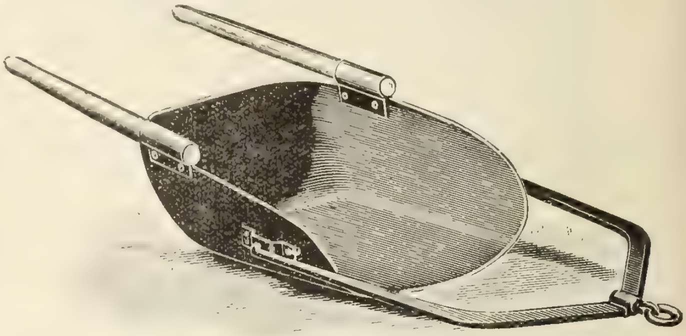
The Rogers Supply Co.
28 King St. West
Toronto
Telephone Exchange M 4155

Toronto Agents for Dundas and Vinemount Quarries

CLEAN STONE

Quick Deliveries
By
G.T.R., C.P.R. or Team

The Best Value for Your Money



IN CONTRACTORS' SUPPLIES

Our DRAG SCRAPERS have pressed bowls of high carbon steel—all joints and seams being eliminated. They are stiff and serviceable. WHEEL SCRAPERS can be supplied with either square pan or pressed bowl, and have the latest and most approved dumping attachments.

Always order by the name—

IRON AGE

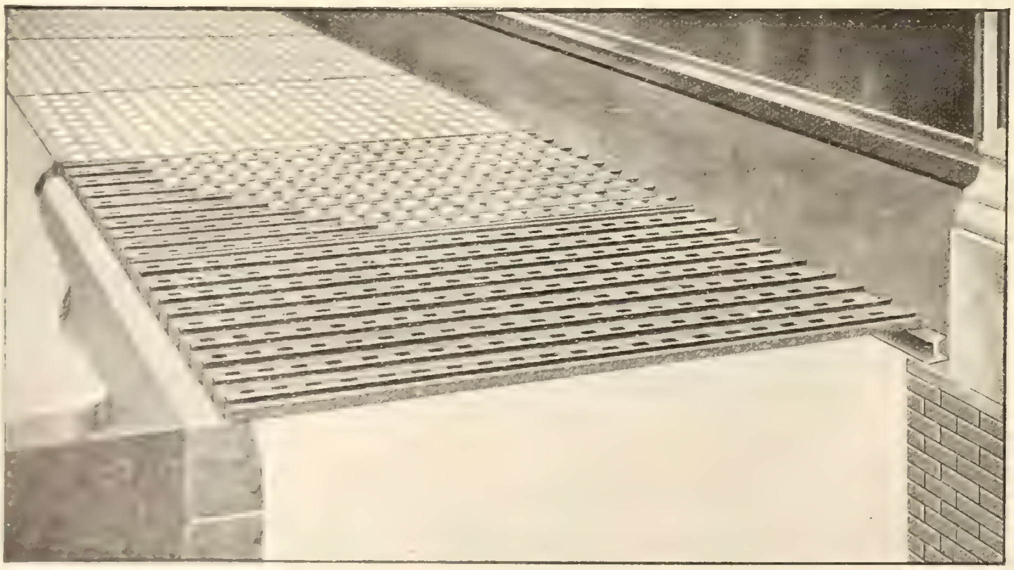
Our STEEL TRAY BARROWS with trays pressed from solid sheets of high carbon steel, without seams or joints, are the standard with all the leading contractors.

Remember we make Pick and Rooter Ploughs to satisfy the most exacting conditions.

Catalogue will be sent free on request.

THE BATEMAN-WILKINSON CO., LIMITED
340 CAMPBELL AVE., TORONTO

Simplex Double Reinforced Vault Light Construction



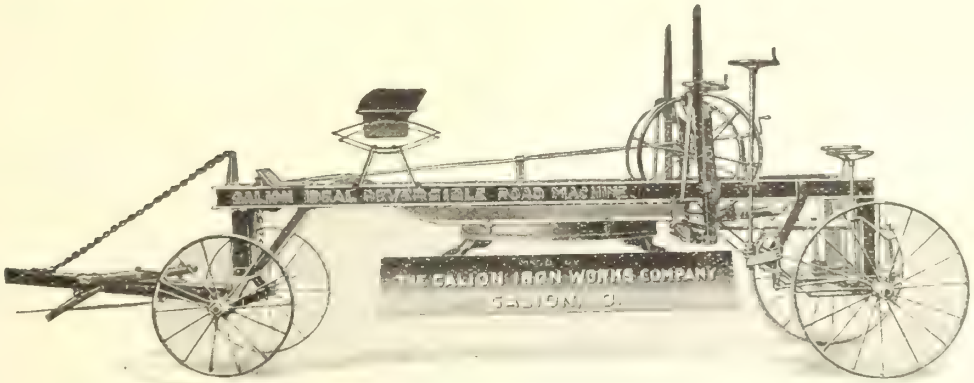
We guarantee this construction to be free from leakage and shaling of the glass.

Sole Canadian Agents and Manufacturers of

SIMPLEX
NU-PLAN
BAR LOCK
3-WAY
QUICK-SET
SIDEWALK
PRISM CONSTRUCTION

HOBBS MANUFACTURING CO., LIMITED
LONDON TORONTO MONTREAL WINNIPEG

Giant Ideal All-Steel Reversible Road Machine


GALION IDEAL REVERSIBLE ROAD MACHINE
MADE BY
THE GALION IRON WORKS COMPANY
GALION, O.

A MOST strong, durable and economical grader—perfect and practical in every way. The "Giant Ideal' is specially designed and constructed for heaviest road work with power roller or tractor. Equipped with the Ideal engine grader steering gear, it makes the most practical and efficient road tool ever built. It has every known improvement for simplicity and ease of operation and is under absolute control of operator at all times. A lighter machine of same design for teams supplied when desired.

We also carry a complete line of:—

Rock Crushers, Portable Engines Steam Road Rollers, Sprinklers, Road Graders, Etc.

J. B. Dore & Fils

362 Craig St. West, - Montreal

also at Laprairie, Quebec

Built With
Hamilton Pressed Brick

Mallory & Thatcher, Architects.

These fine new apartments in Toronto are being built of the popular Hamilton Red Pressed Brick

Popular, because its deep uniform red shade is always the same and never fades.

1,000,000 bricks are on hand in our yards ready for immediate shipment.

Hamilton Pressed Brick is made from shale, rich in ironoxide and free from so called soda.

It has been used in many of the leading public buildings, schools and residences throughout Canada.

Send us your next rush order.

Hamilton Pressed Brick Company
Limited

Spectator Building, Hamilton, Ont.

Phones	
Factory	1992
Office	2931
Residence	345

Toronto Representative, WALTER HUNTER, 105 MACDONELL AVE. Telephone Park 3170

ELECTRICAL

Wires and Cables

In

Copper and Aluminum

Copper Clad (Duplex Metal) Wire

Galvanized Steel Strand for Guys

Canada Wire & Cable Co., Limited

1170 Dundas St., Toronto

Stock of Wire and Cable carried in
TORONTO, MONTREAL & WINNIPEG

Sales Agents:

Roper, Clarke & Co., Ltd., MONTREAL
A. E. Esling, Scott Block, WINNIPEG
Macdonald, Marpole Co., Ltd., VANCOUVER
Gorman, Clancy & Grindley, Ltd., EDMONTON and CALGARY

BUILDERS SUPPLIES

- Lime
- Portland Cement
- White Cement
- Keenes Cement
- Plaster Paris
- Hard Wall Plaster
- Mortar Colors
- Fire Brick
- Sewer Pipe
- Weeping Tile
- Sacketts Plaster Board
- Parkers Corner Bead
- Rubble Stone
- Crushed Stone, Etc.

With our 9 Branch yards situated as they are we are prepared to guarantee a prompt delivery service of any orders you may favor us with and would ask you to give us a trial in order that we might prove same to you and also prove the excellence of our material.

Ontario Lime Company

Limited

Crown Office Building, Toronto, Ont.

Head Office Phones: Main 5472—5473

Why don't YOU do this?

PAID FOR ITSELF IN ONE MONTH

Peterson, Iowa, Jan. 29, 1913

I first saw one of your LITTLE WONDERS working at Everly, Iowa, and it looked so good to me that I bought a machine at once.

My LITTLE WONDER "FIVE" paid for itself in just one month. I have worked around several different mixers and the LITTLE WONDER "FIVE" has them all beaten. W. E. JOHNSON, Contractor and Builder.

You can make more money with this Concrete Mixer than with many of larger capacity and greater cost. Mixes 35 to 50 cu. yds. per day on one gallon of gasoline; many contractors far exceed this. Saves 40 cents per cu. yd. over hand work.

LITTLE WONDER "FIVE"

"The Small Job Money-Maker"

TEN DAYS' FREE TRIAL

and our "Man to Man" proposition for payments make this the best "buy" ever known in mixers for small work. Thousands of contractors in the States are doubling their profits with it—why not you?

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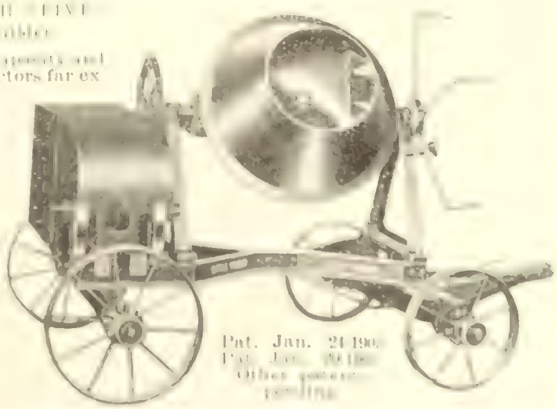

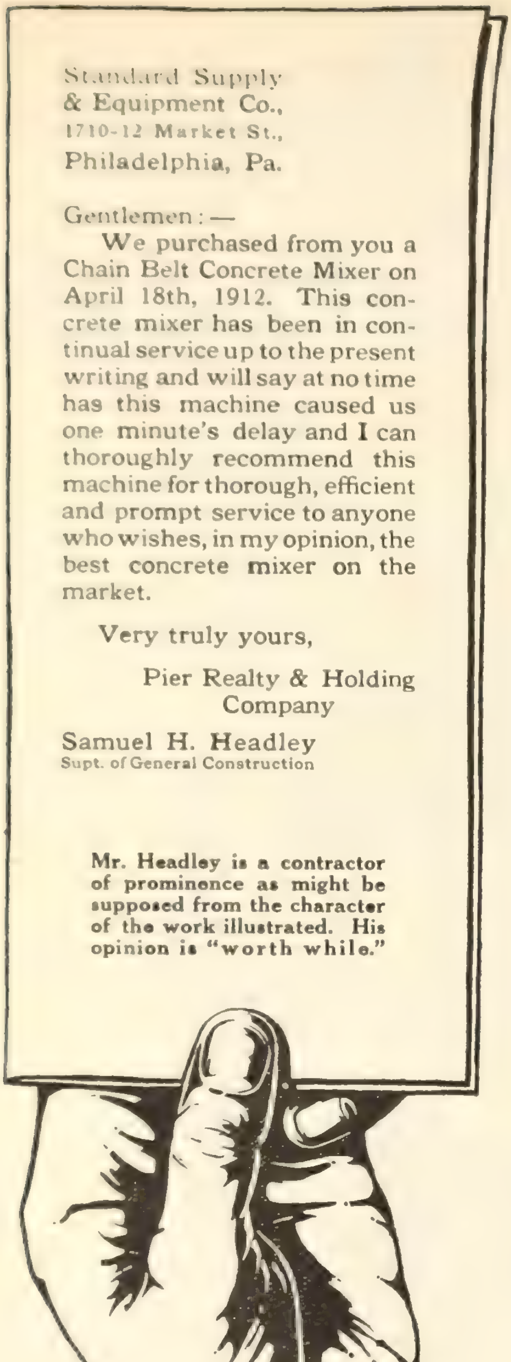

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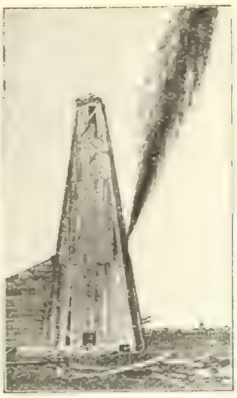

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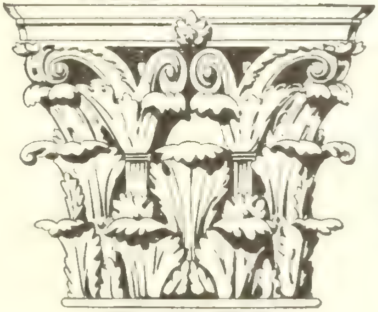

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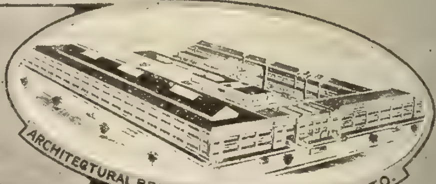

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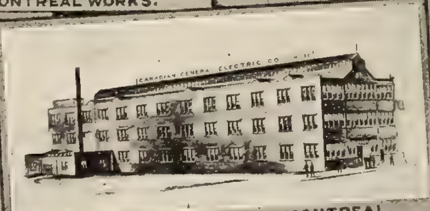

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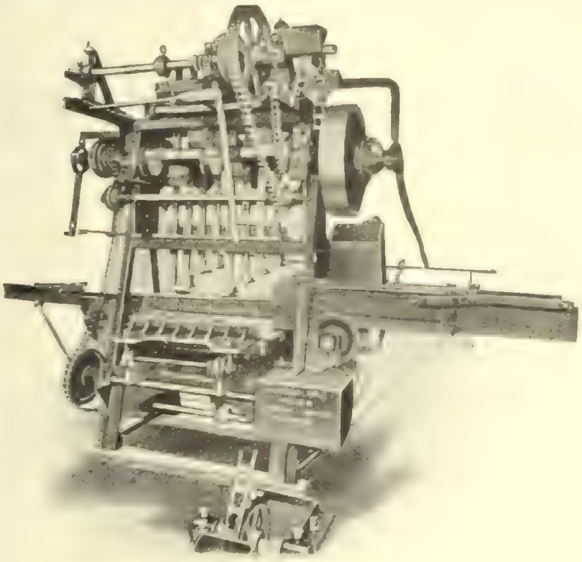

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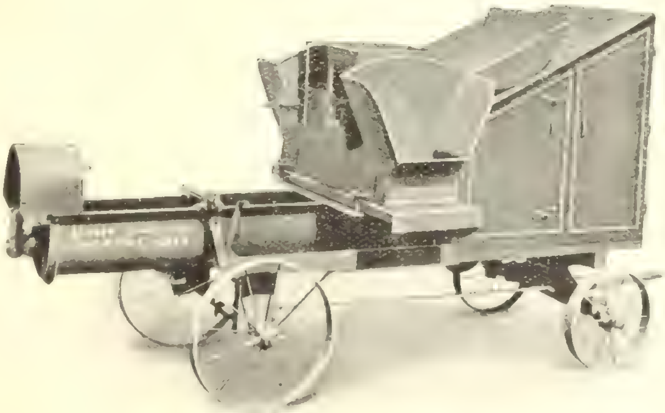

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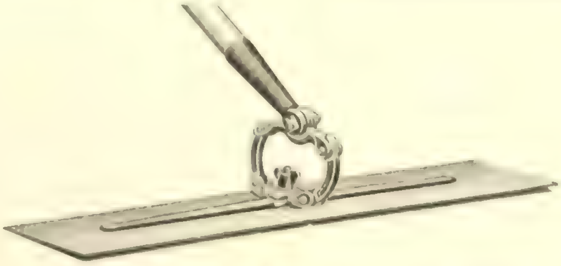

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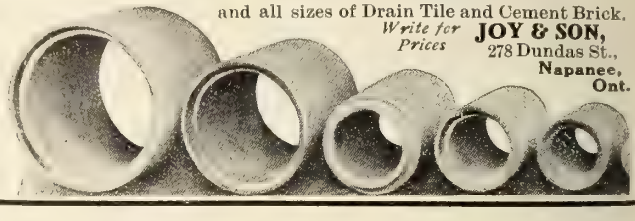

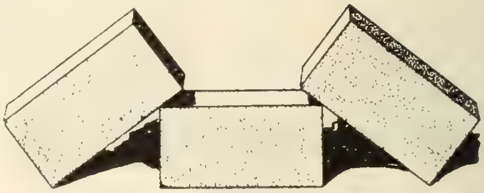

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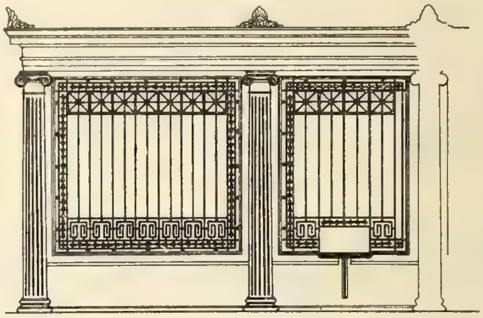

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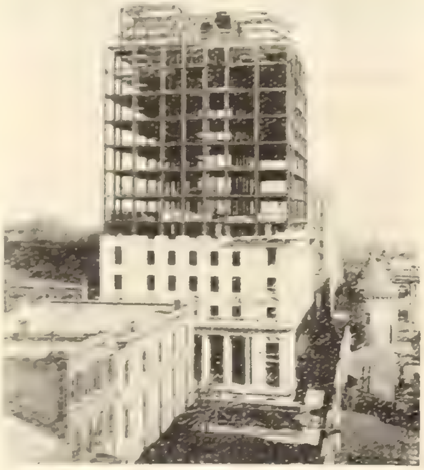

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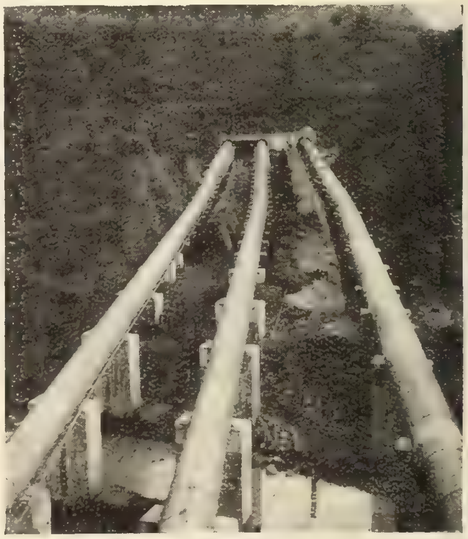

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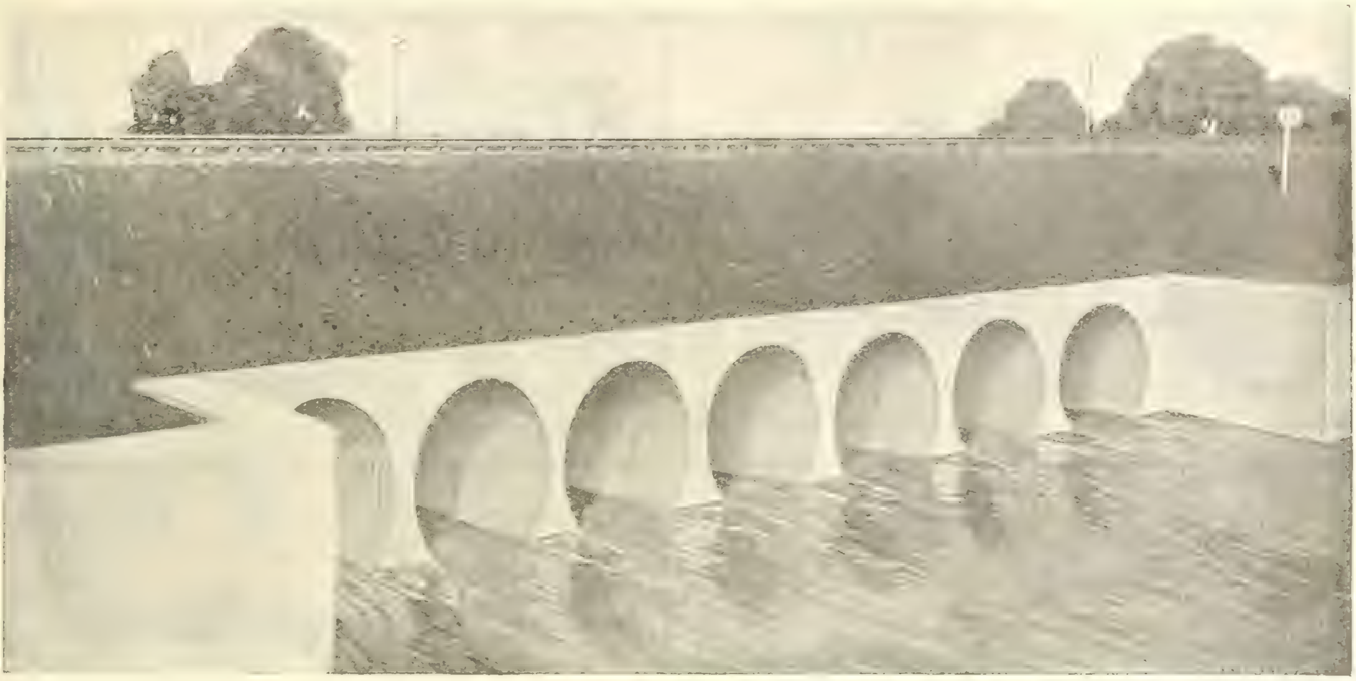

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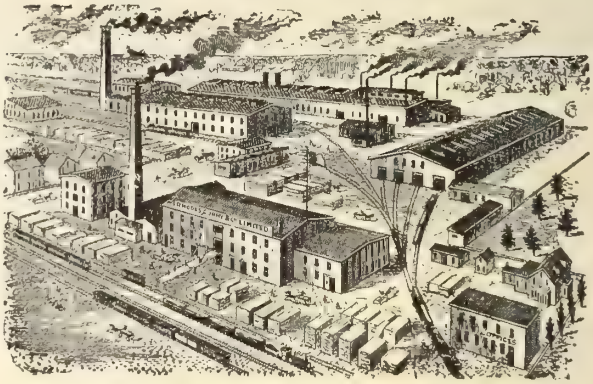

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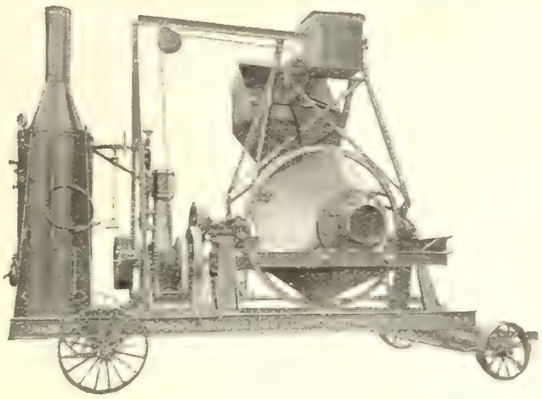

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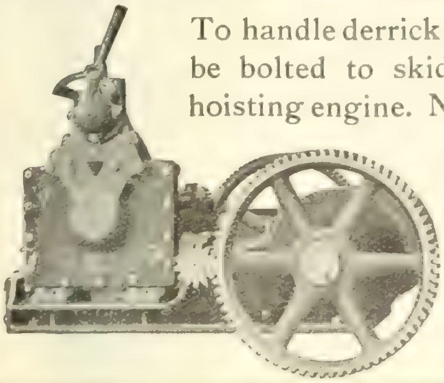

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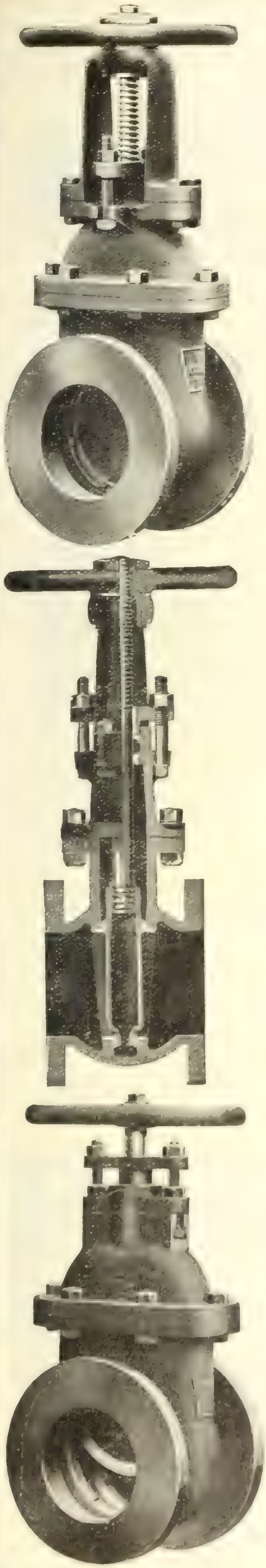

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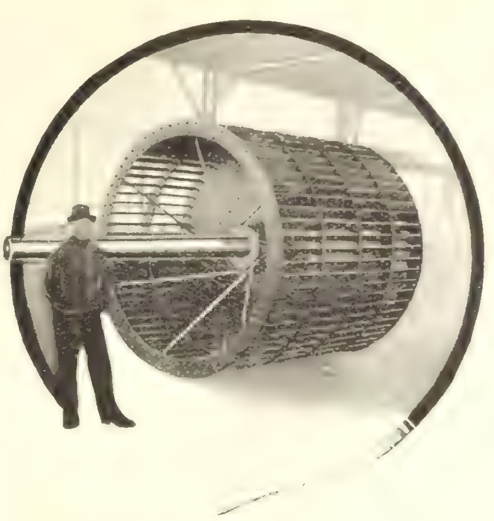

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Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at [illegible]

	Per M
No 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 00
[illegible] bricks	15 00
No 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

[illegible]

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving..	36 00	42 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

[illegible] Posts Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90 ...		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

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Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 15 per cent.; lead waste, $9.00, less 15 per cent.; caulking lead, 6½ cents per lb.; traps and bends, 40 per cent.; pig lead, 5c lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 65 per cent.

7 and 8-inch pipe, 50 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

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Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ¾-inch, $1.45.

Burnt River rubble stone delivered, $15 to $16 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $15 to $16 per toise.

Brown coursing stone, delivered, $3.25 to $3.50 per yard.

Grey coursing stone, delivered, $2.25 to $2.50 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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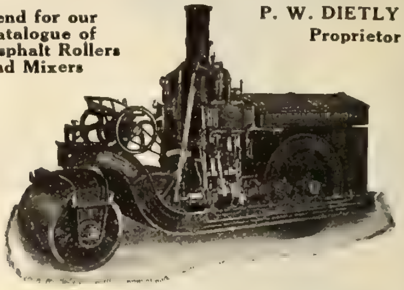
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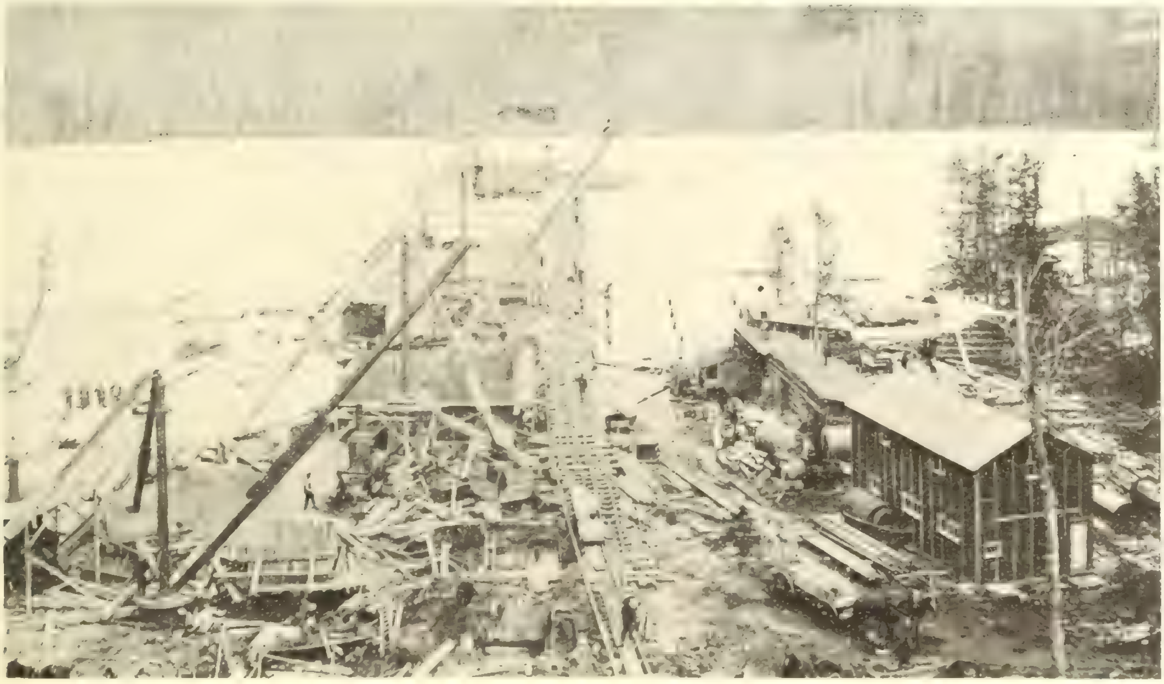

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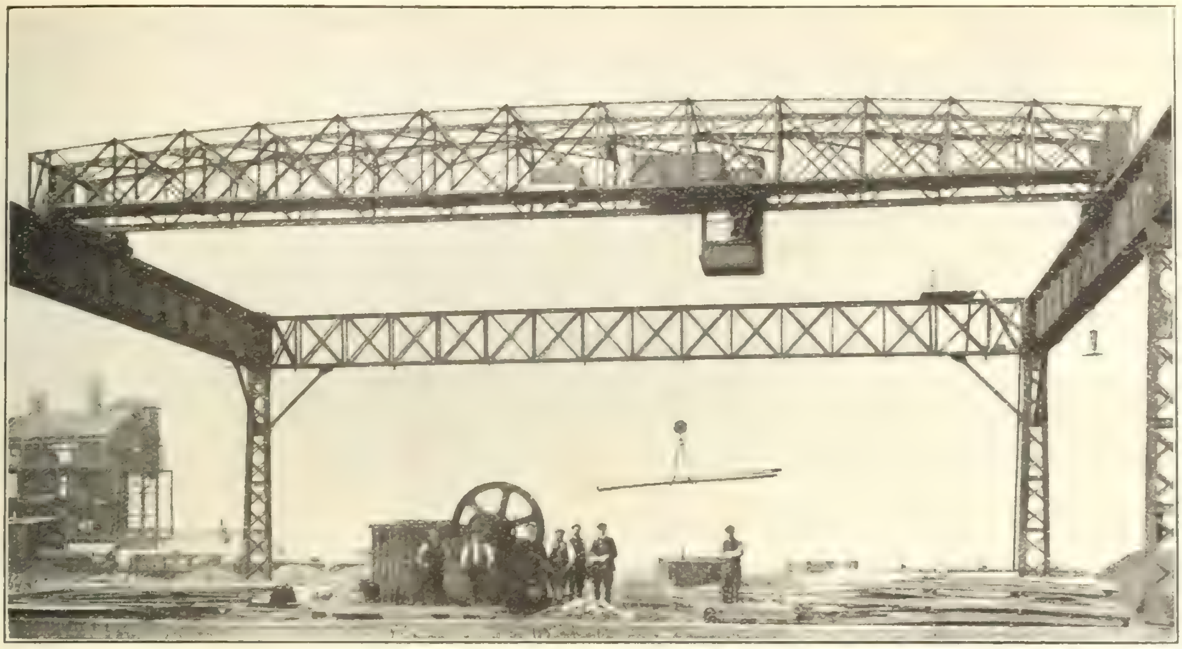

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Deposited 1 cu. yd. of concrete per minute

on the construction of the Fourth Avenue Subway, New York City. This was done day after day with a 2 yd. concrete bucket. Four of these cranes were used on this work by the Tidewater Building Company and Thos. B. Bryson, Contractors. Besides handling the concrete, the cranes were used in excavating, unloading sand and gravel (65 yards per hour), and handling all the heavy material.

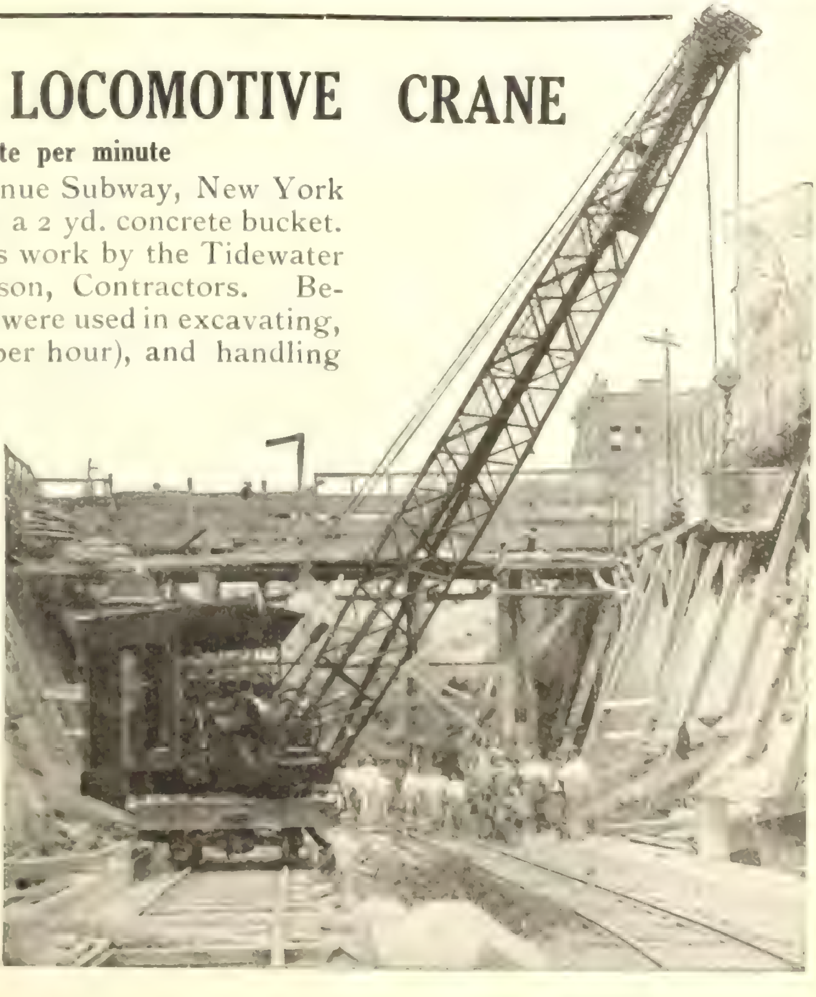
CONTRACTORS

Use the Brownhoist Crane

because it is built for a hard and continuous service. Delays are expensive to any contractor and he cannot afford to have a crane that is continually breaking down. The Brownhoist Crane is used by contractors in all parts of this country and we want you to investigate its record. Ask the man who has one.

[illegible]

The
Brown Hoisting Machinery
Company
CLEVELAND, OHIO.
New York Chicago Pittsburgh San Francisco



Renfrew Lime Will Save You Money

Not because it is cheaper than other limes but because it has some advantages not found in other brands.

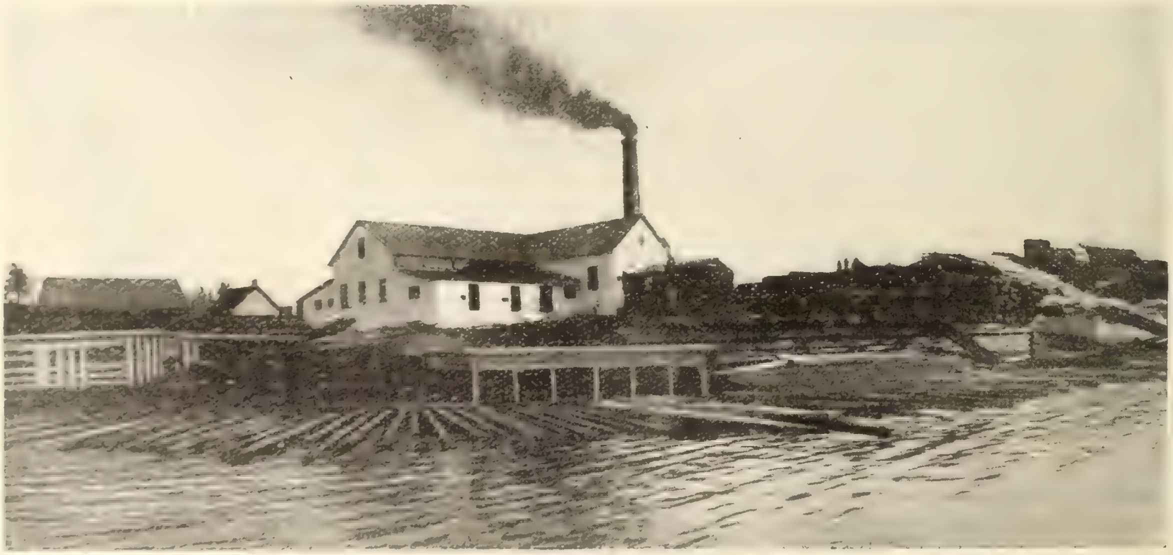
It is easily beaded down and does not set too rapidly, allowing the brick-layer to spread for more bricks. It requires but little time for tempering and sets hard as rock.

Try "Renfrew" Lime on your next job.

White Lime - Stone - Gray Lime
Brick - Drain Tile

JAMIESON LIME CO.

Renfrew, Ontario



Specifications sawed to order.
Heavy yellow pine and fir timbers on hand.

James Sheppard & Son

Sorel, Quebec

Erected at Seven Falls, Quebec, Distributor Pipe nd Branches, under 450 ft. Head.

Structural and Steel Plate Work

is our specialty, We fabricate and erect from your drawings, or will design your structure for you.

No Work Too Large for us to handle in the minimum of time. May we estimate on your requirements?

WALSH PLATE & STRUCTURAL WORKS, LIMITED

Drummondville, Que. Holyoke, Mass.

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Block, Sawed, Planed
and Turned

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Quarries and Mills

near Clear Creek, Indiana

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Representative, Toronto, Canada,
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Mill Blocks
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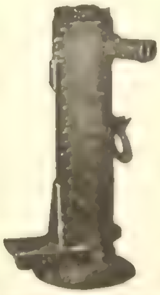
THE H. & E. PATENT BALL-BEARING LIFTING JACKS

For Railway and Bridge Work, Contractors' and Builders' Use



Made by practical Jack Builders. Material: best grades of malleable iron and steel. Fully guaranteed as to durability and efficiency. The long even stroke of the lever together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

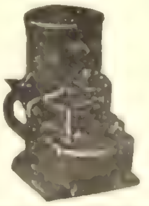
Manufactured by

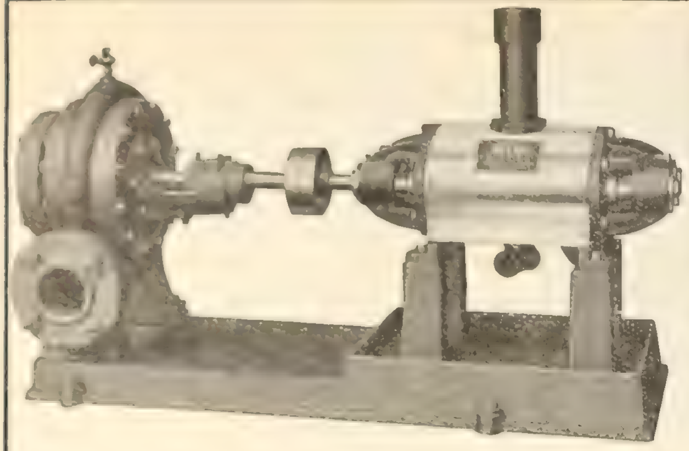
Canada Lifting Jack Co., Ltd.

(Formerly the H. & E. Lifting Jack Co.)

Waterville, Que.

Stock carried by F. H. Hopkins & Company, Montreal





The new factor in Pumping Cost.

The remarkable performance of the Spiro turbine as applied to centrifugal pump drive, merely proves the old truth about the cardinal virtue of simplicity.

A gas producer yields a horsepower from the smallest quantity of coal, yet a steam operated Spiro-Centrifugal pumps a gallon of water at a much smaller total cost, figuring attendance, depreciation, investment and fuel combined.

Over and above this, the Spiro-Centrifugal has set up a new standard in continuity of operation, and by its almost total absence of repair cost.

"Buffalo" SPIRO-CENTRIFUGAL PUMPS

No one dreamed that a pair of plain herring-bone gears could be made into an engine or turbine before the advent of the Spiro. This new principle is revolutionary and has reduced prime mover construction to what would seem the limit of simplicity, service and economy combined. Not a single blade, nozzle or valve in the entire unit. Just a pair of herring-bone gears enclosed in a cylinder, with a jet of steam blown against them.

Ask for new 84-page catalog No. 225, and investigate the wonderful adaptability of the Spiro for direct connection to Pumps, Fans, Generators and machinery used in mining, quarrying and other pursuits.

Buffalo Steam Pump Co.

Sole Canadian Agents—

CANADIAN BUFFALO FORGE CO.
Limited
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Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

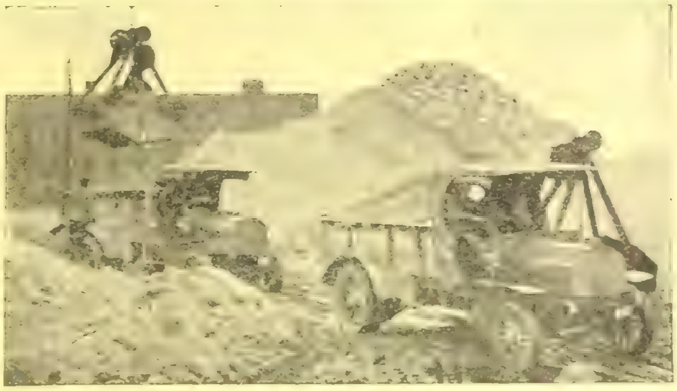
"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

MACK

13 Questions For the Contractor To Answer



The Perry Sand Co., of Buffalo, using Mack Trucks

If as a contractor you are not using motor trucks, ask yourself the following questions and answer them honestly:—

1. How many horses have you?
2. How much money have you invested?
3. How much does it cost per day to operate your teams?
   (a) Including interest on total investment for horses, trucks, harness and other equipment?
   (b) Stable charges?
   (c) Drivers, etc.?
4. What is the life of a horse?
5. Do you figure depreciation on this basis?
6. How many cubic yards or tons can you haul per day?
7. Are you willing to be convinced that motor trucks can do this amount of work at a lower cost?
8. Can you improve your loading and unloading facilities to reduce time lost in this way?
9. What is your average length of haul?
10. How many trips can you make with horse trucks?
11. Do you know that a single automobile truck is doing the work of four horse teams in your business?
12. Is there any reason why the automobile truck cannot do as much for you?
13. Isn't it worth your while to investigate this situation?

Ask us about the "MACK"

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

ADANAC RED CORE RUBBER COVERED WIRES AND CABLES

RUBBER COVERED TRADE ADANAC MARK WIRES AND CABLES

Are made according to the specifications of the National Board of Fire Underwriters. The conductors are drawn from copper of the highest conductivity and are covered with two thicknesses of thoroughly vulcanized rubber compound of high quality. The wires are braided over insulation and the smooth high finish they receive makes them specially desirable for conduit work.

IMPERIAL
WIRE AND CABLE
COMPANY
Limited
MONTREAL

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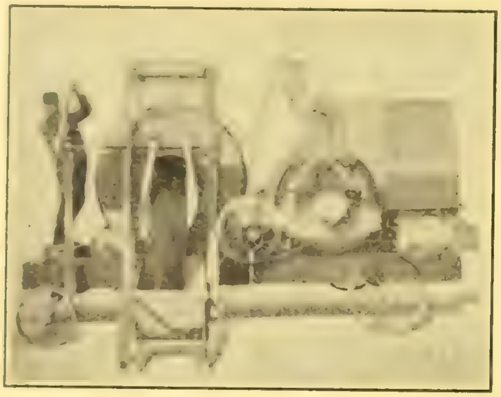


"Ransome" Concrete Mixers

For All Classes of Work

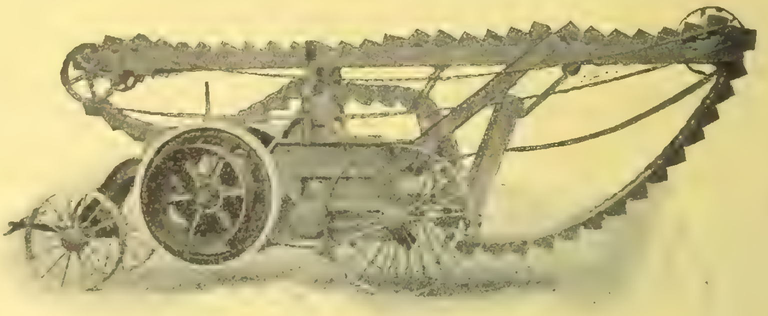
We make a specialty of machines adapted for street paving and road building, and by reason of our wide experience in the field can advise you the type best suited to your needs.

Concrete Mixers are furnished with steam, electric or gasoline power in all capacities.

Our "Ransome Red Book" covering Concrete Equipment of all kinds is ready for distribution. Let us send you a copy.

We will be pleased to send you our latest books entitled:—

Road Builders Equipment
also
Ransome Red Book



"Reliance" Stone Crushers

The "Reliance" has a crushing motion which is the simplest and most powerful. The frame and working parts are solid castings of open hearth steel. The journals are extra large, well protected and lubricated. The jaw and cheek plates are reversible. The size of product may be very easily changed. Supplied in all sizes,

"Huber" Steam Rollers—"Ames" Portable Engines and Boilers—Porcupines—"Stover" Gasoline Engines—Sprinklers—Wagons—Graders—Barrows—Plows—Wheel and Drag Scrapers

F. H. Hopkins & Co.

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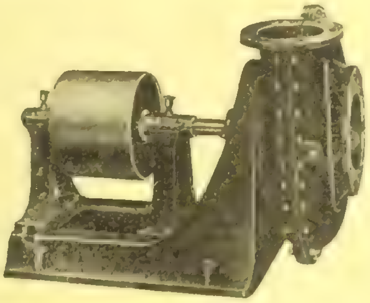
Vol. 27 Toronto, June 18, 1913 No. 25

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps
Condensers, Travelling Cranes



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HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works : 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

- Simplicity of Design
- Noiseless Running
- Compact Design
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- Continuous Operation
- Overall Efficiency

Messrs. Belliss & Morcom, Ltd.
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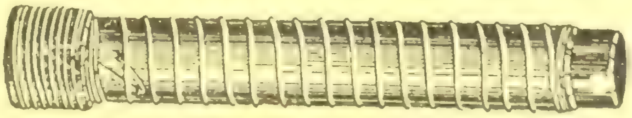
Board of Trade Building, MONTREAL



Continuous and Machine Banded Wood Stave

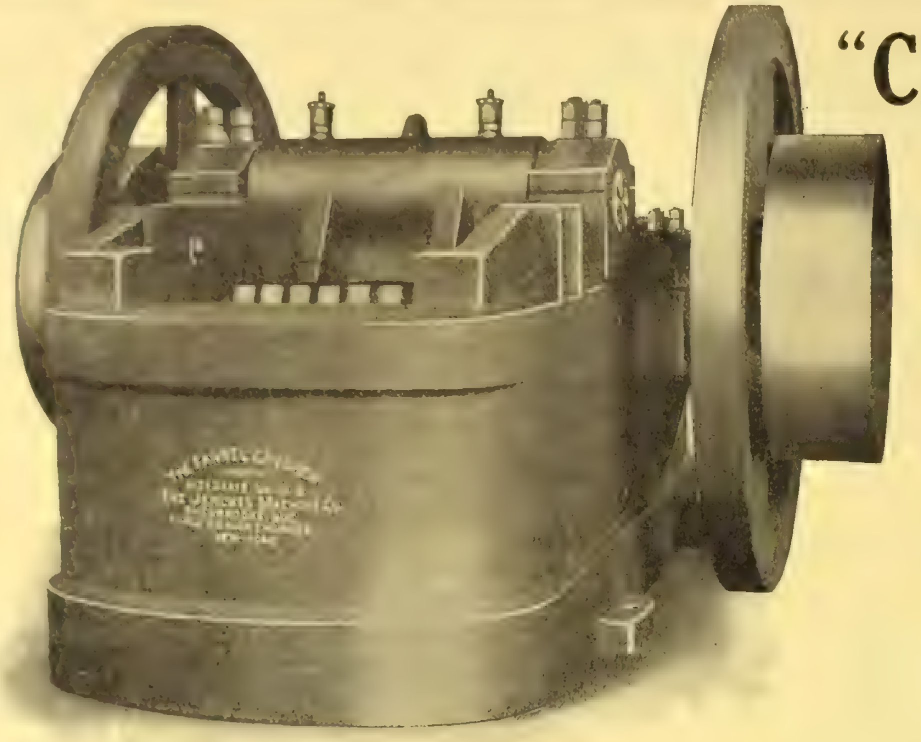
WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One half the cost of Iron Pipe— and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



"CRUSHERS"

Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. Works: Sherbrooke, Que. - St. Catharines, Ont.
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EVERY "AMERICAN"

HOISTING ENGINE

IS BUILT FOR HARD USAGE

It is frequently unprotected, handled roughly, overloaded, neglected and abused in various ways.

We have studied these conditions for 28 years with the result that the **"American" engine is made better than the utmost demands upon it call for.**

You will realize from the above that there is very much more to consider than the first cost of the engine.

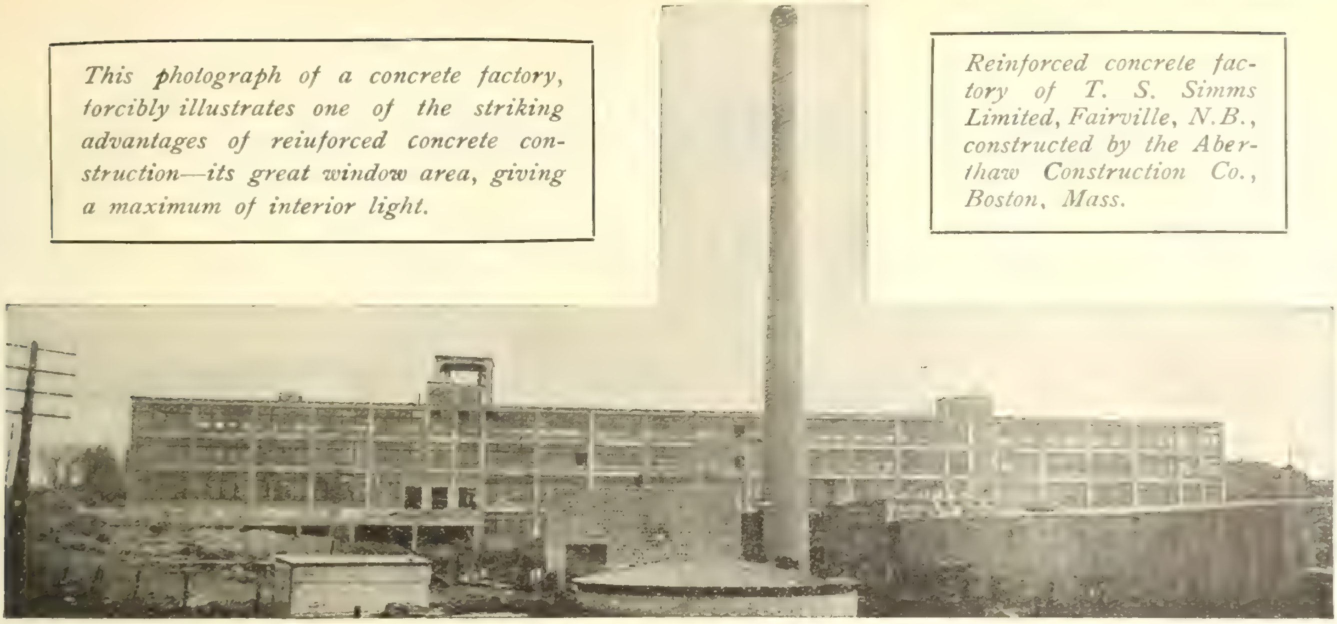
American Hoist & Derrick Company

St. Paul, U. S. A.

Gorman, Clancey & Grindley—Edmonton and Calgary Alta. and Nelson, B. C.
Vancouver Machinery Depot, Ltd.—Vancouver, B. C. Stuart Machinery Co.—Winnipeg, Man.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

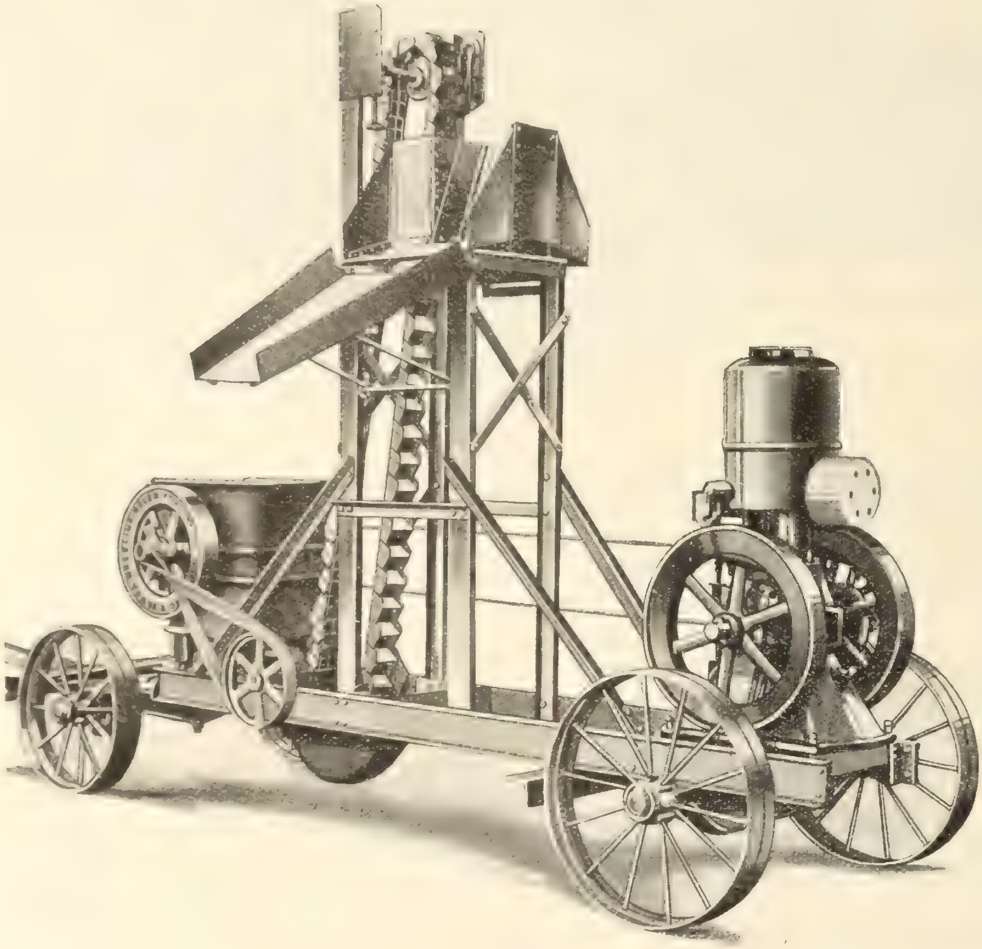
Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company
Limited
Montreal

Investigate This Wheeling Motor Crusher Outfit



Recall the times you could have used a portable crusher like the one illustrated.

It consists of a **No. 2 Wheeling Forced Feed Crusher** on steel trucks with a gasoline or steam engine, elevator and chute. It is self-contained.

Outfit as illustrated weighs 6100 lbs.—half the weight and twice as strong—being made of steel throughout.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

Do You Realize

What a Wheeling Forced Feed Crusher Would Save You?

When you are tearing down a stone building, blasting a grade for a road, chiseling a roadway, crushing old paving block, it is a great deal cheaper to crush your stone right on the job, selling the crushed stone, than to pay enormous prices to haul it away in the lump.

You can frequently pay for the crusher on one job.

The Wheeling is adjustable to crush to any size by simply turning a hand wheel.

Write for full particulars.

LIMITED

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(Continued on page 12)

Don Valley Clay Products

For over twenty-two years the products of the Don Valley Brick Works have been increasing in variety, quality and popularity. To-day Don Valley Products are regarded as the best in America in every way.

Buildings erected years ago of Don Valley Brick look as clean-cut and fresh to-day as when they were built.

Don Valley Brick has won out in competition with the leading brick manufacturers of the world.

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Don Valley Fireproofing, Bricks and Tile used throughout.

Traders Bank, Toronto

Carrere & Hastings and F. S. Baker, Associate Architects.

Don Valley Porous Terra Cotta Fireproofing and 2,0000,000 Don Valley Brick used.

Porous Terra Cotta Fireproofing

Don Valley extensive clay and shale deposits include a clay particularly well suited to the manufacture of Porous Terra Cotta. This raw material coupled with our modern facilities and experience enable us to burn tough and strong fireproofing.

Don Valley Clay Products are used in most of the important buildings from Halifax to Vancouver.

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Eustace G. Bird, associated with Carrere & Hastings, Architects. Norcross Bros., Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Bell Telephone Building

Adelaide Street, Toronto

W. J. Carmichael, Architect. Wickett Limited, Contractors.

Don Valley Porous Terra Cotta Fireproofing and Bricks used.

Always Specify "Don Valley" Clay Products

Don Valley Brick Works

TORONTO - ONTARIO

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MAXIMUM EFFICIENCY AT MINIMUM COST

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One of the more than two hundred highway bridges throughout Canada with Steelcrete Expanded Metal Reinforcing for the floor slabs.

Slabs of concrete reinforced with "Steelcrete" Expanded Metal make a permanent bridge floor of the greatest strength, at the least cost, and with the least amount of superimposed dead load on the bridge. "Steelcrete" possesses an absolutely mechanical bond against vibration. It lies flat. Once placed, disarrangement is impossible. The meshes are diamond shaped, the joints absolutely rigid. There are no corrugated or twisted strands. When the load is applied there is no straightening out to split the concrete before the reinforcement comes into tension.

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Before You Buy Concrete Machinery

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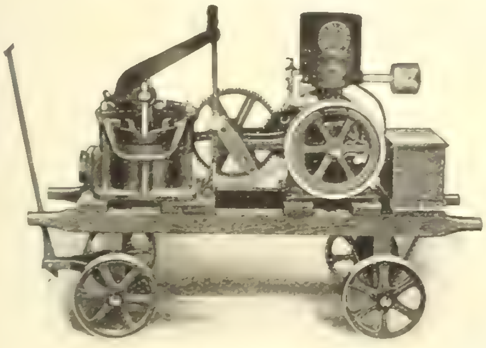
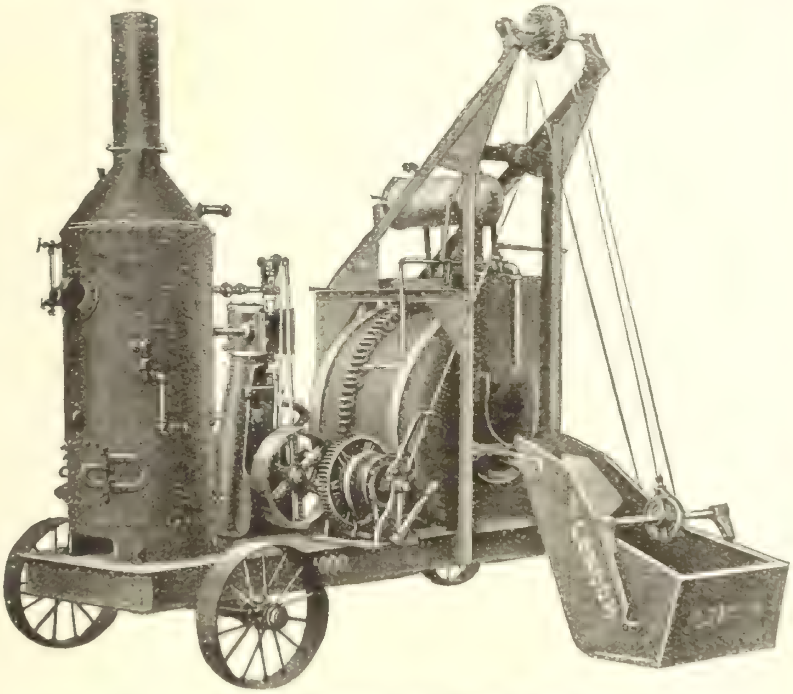


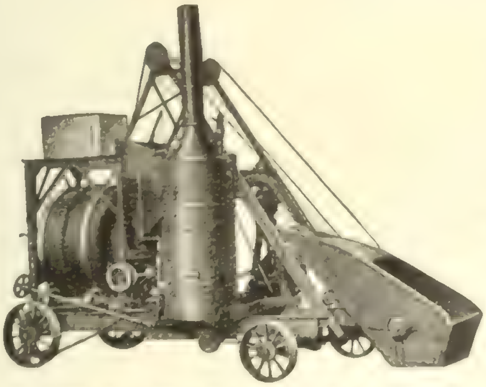
Power Diaphram Pump



London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.

We are the largest manufacturers of Concrete Machinery in Canada.



Rear Discharge Traction Mixer. This machine is also equipped with Boom

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture-

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

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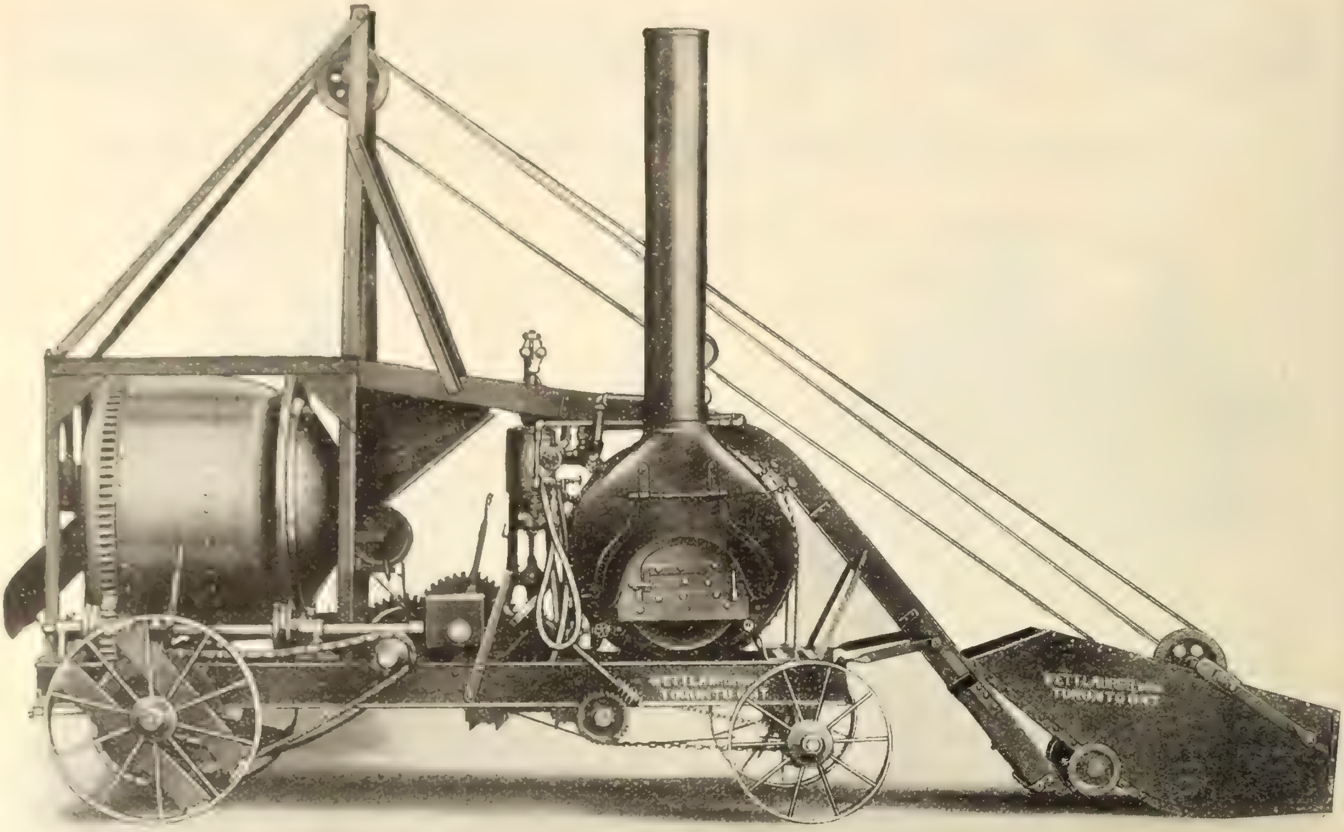
The Largest Manufacturers of Concrete Machinery in Canada



Wettlaufer

Improved Stationary Heart Shape Drum Traction Mixer

Another Wettlaufer achievement with decided advantages over all other mixers. The following are a few of its merits: Built of steel throughout. Extreme width only 7 feet making it suitable for work on car tracks and narrow streets. The horizontal boiler means a big saving in fuel. The flues are always covered with water thereby lengthening their life. The furnace is the full length of the boiler and is provided with a large combustion chamber. This mixer cannot be upset because of the even distribution of the load. In construction of traction only two reductions of gears are used. Drum can be thrown out of gear when tractioning or when not in use. Loading skip comes flat down to the ground making easy loading—it is operated with one lever.

One man operates the entire outfit from one position.

This mixer contains many other features which will be explained in other advertisements or write us. Daily demonstrations at all our branches.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

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They
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Scotch Drybacks

Steel Water Towers, Tanks and Heavy Plate Work.
Cast Iron Columns and Bases. Post Hangers

Buy
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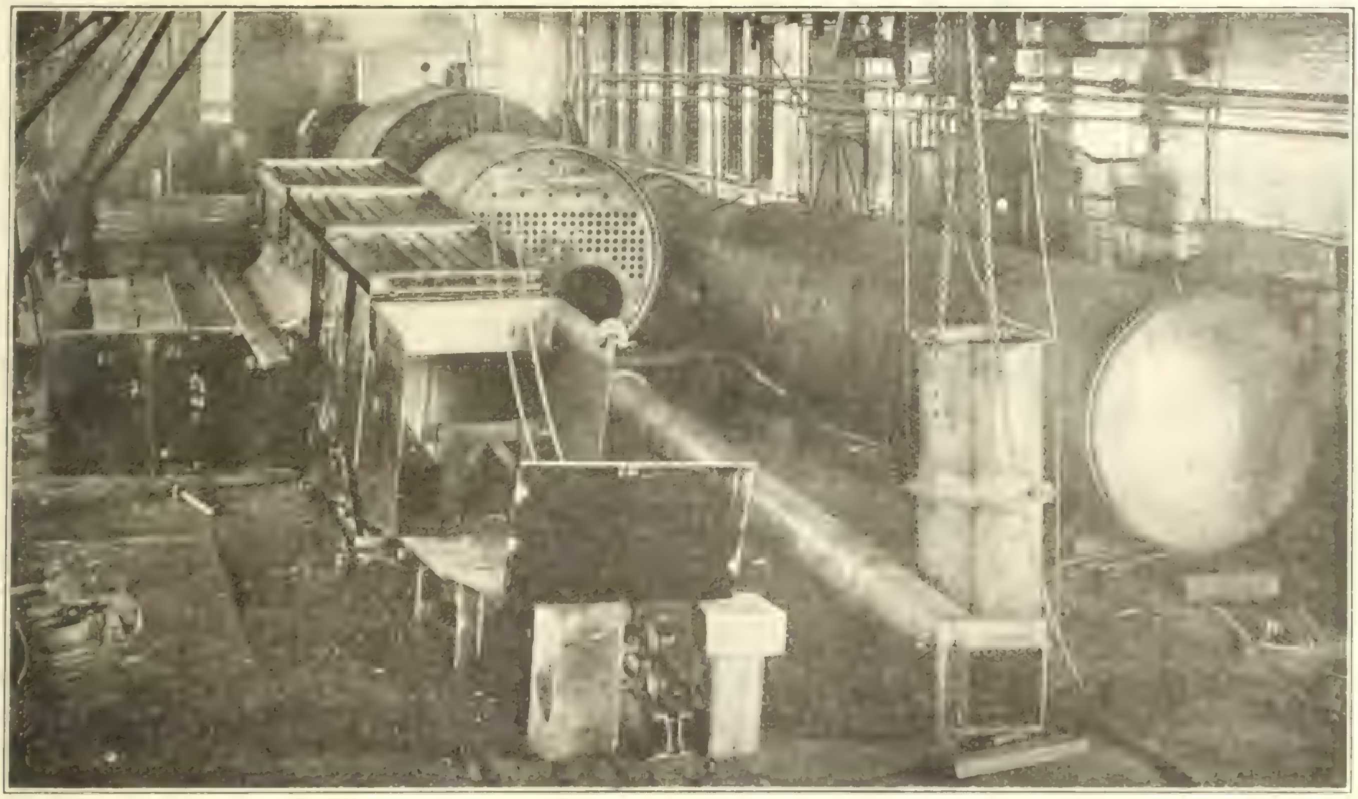

A small section of our Boiler Shop
showing a few Marine Boilers
under construction.

The Berg Machinery Mfg. Co., Limited

Boiler Department

Bathurst and Niagara Sts. **TORONTO, ONTARIO**

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Ontario Lime Co., Ltd.

Lime Kilns
Improved Equipment Co.

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Montreal Locomotive Works
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Missisquoi Marble Co.

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Steel & Radiation Ltd.

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McDougal Caledonian Iron Wks
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Goheen Mfg. Co.
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Paterson Mfg. Co., B.
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Canada Foundry Co.
Canadian Boving Co.
Canadian Buffalo Forge Co.
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Canadian Ingersoll-Rand Co.
Can. Supply & Contracting Co.
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Mussens Limited.
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Improved Equipment Co.
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Steel & Radiation Ltd.
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Turner, C. A. P.

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Paterson Mfg. Co.

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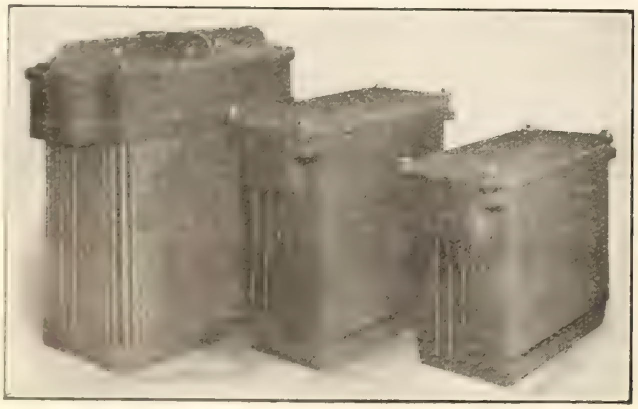
Power Logic

Reduced Loss
Increased Profit — **Ferranti Transformers**



Three Phase Pole or Station Transformers

The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one because of the great reduction in energy-loss made possible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

Write us for particulars

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
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Office of Dominion Iron & Steel Co., Ltd.
Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

In Building Canals

Excavating Ditches, Reservoirs, Loading Wagons, Building Levees, Embankments, etc., there's an unequalled saving in using the sturdy

Western Elevating Grader

Will move 1000 cubic yards per day. Free from complicated parts. Built strong. No annoying breakdowns. Has made records as to strength and durability. There are many "reasons why" you need the Western Elevating Grader. Our Catalog will tell you.

Write today.

Western Wheeled Scraper Co.
Aurora, Illinois
Earth and Stone Handling Machinery
E. P. Jamison & Company, Ltd., Vancouver
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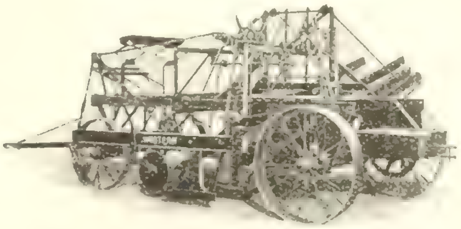

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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Ontario Lime Co., Ltd.
Ontario Sewer Pipe Co.
Smyth & Ryan.
Standard Clay Products Ltd.
Nova Scotia Clay Works Ltd.

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Montreal Locomotive Works.
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Lundy Shovel & Tool Co.

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Des Moines Bridge Co.
Hamilton Mfg. Co., Wm.

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Cabot, Inc., Samuel.
Pinchin, Johnson & Co.

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Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Steam Turbines
McDougall Caledonian Iron Wks.

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Dominion Steel Castings Co.
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Provincial Steel Co.

Steel Bars
Canada Steel Co., Ltd.
Steel Co. of Canada.
Steel & Radiation, Ltd.

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McClary's.

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Britnell & Company.
Brodie, James.
Consolidated Stone Company.
Contractors' Supply Company.
Corinthian Stone Company.
Crushed Stone, Limited.
Hagersville Contracting Co.
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Morrison & Co., T. A.
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Ontario Lime Co., Ltd.
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Canada Steel Company.
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Marsh & Henthorn.
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McDougall Caledonian Iron Wks.

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Greening Wire Co., B.
Steel Company of Canada.

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For over twenty years we have been making this remarkable unfading natural
RED BRICK
Distinctive in its rich, clear, fresh color
"Bradford Reds"
Manufactured in Roman and Standard sizes, are unequalled for uniformity and shade
A pressed brick and each one is inspected before being shipped.
Thousands of buildings and residences are our testimonials
"Bradford Ruffs"
Manufactured with rough textured face offer an unsurpassed rustic effect, specially desirable for residences walls, fences and such ornamental construction.

BRADFORD PRESSED BRICK COMPANY
THE RED BRICK PEOPLE
BRADFORD, PA.

Barrett Specification Roofs

Not An Experiment

When a practical man has a large building to roof, like this one, he cannot afford to take any chances. He does not want an experiment. He wants a roof of proved merit. That is why Barrett Specification Roofs are so popular.

Roofs constructed according to the principles laid down by The Barrett Specification have been giving satisfaction for **more than sixty years.**

Such a roof is constructed of five plies of tarred felt, with coal tar pitch as the waterproofing material, and covered with a top surface of gravel, slag or tile. Its life is usually 20 years or more; it rarely requires attention during that period, and is fire retardant.

Ask our nearest office for a free copy of the Barrett Specification. It will convince you that such a roof is bound to give satisfaction.

SPECIAL NOTE

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The Dampproofing Paint.

[illegible] capacity and is vastly sup[illegible] permanence and resistance to dampness. It penetrates into the pores of the brick [illegible] sion does not break the waterproof seal. Furnishes satisfactory base for plaster and keeps the plaster from [illegible] wall.

VELVEX

[illegible] Shingle Stain.

Send for the new free [illegible] ed in colors, showing the [illegible]

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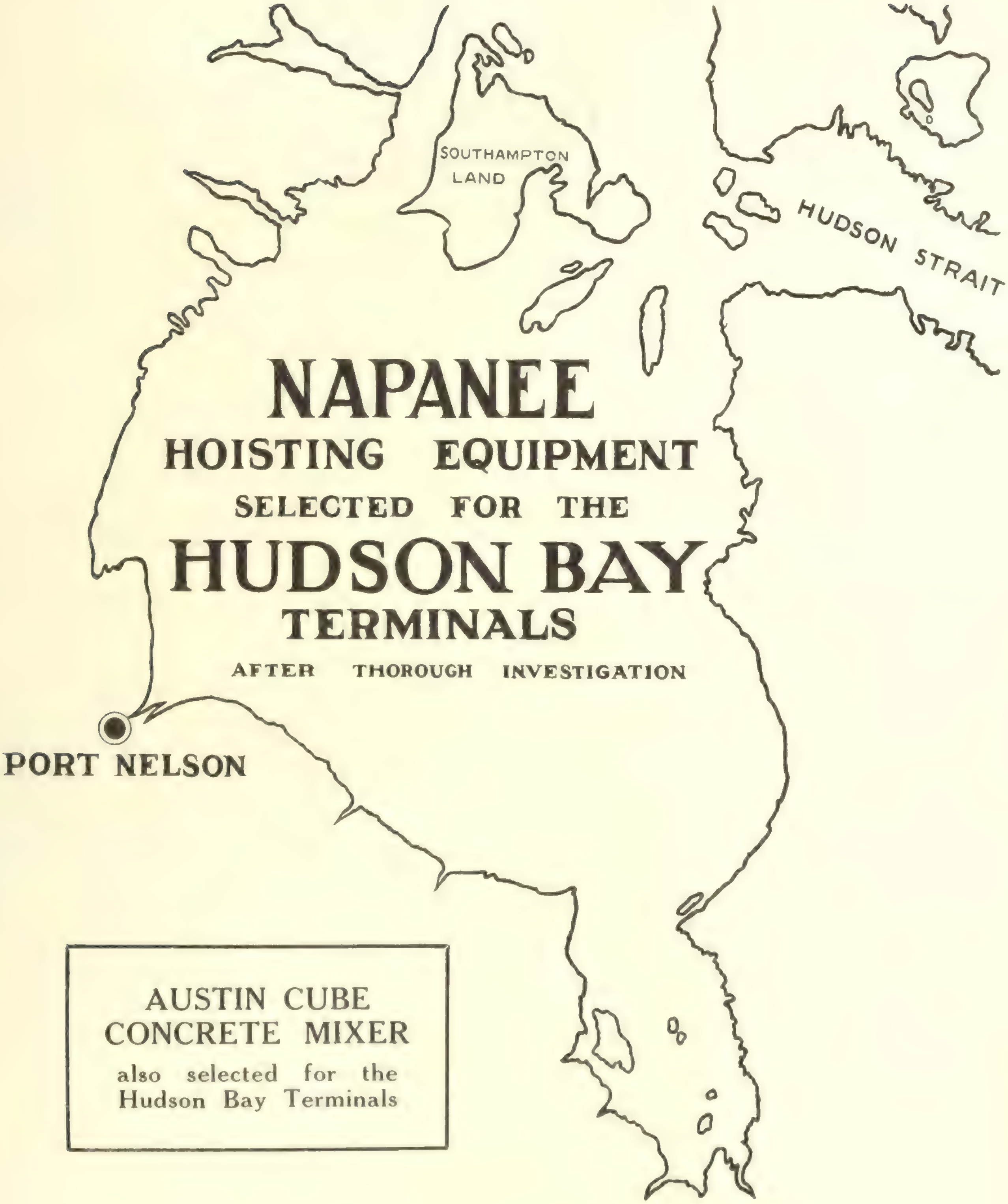

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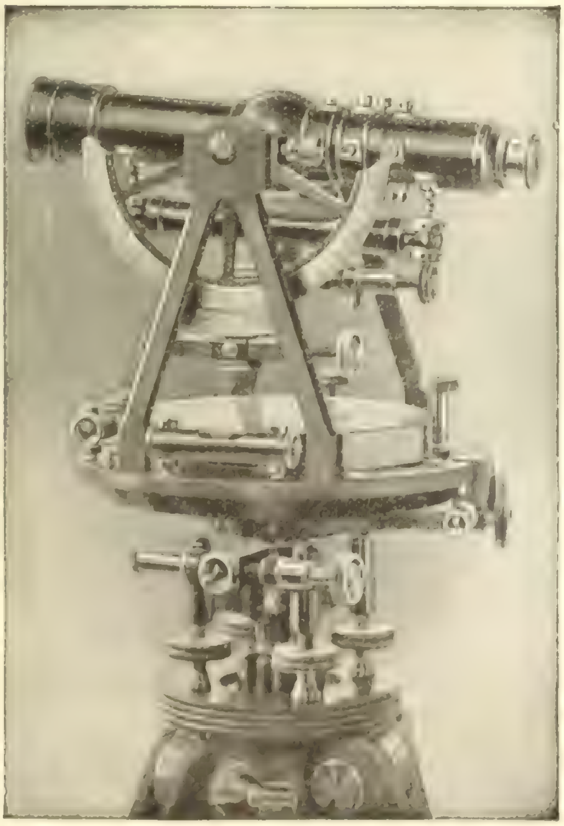

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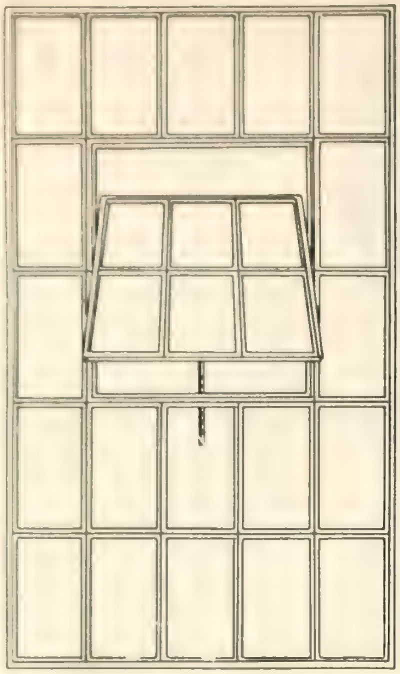

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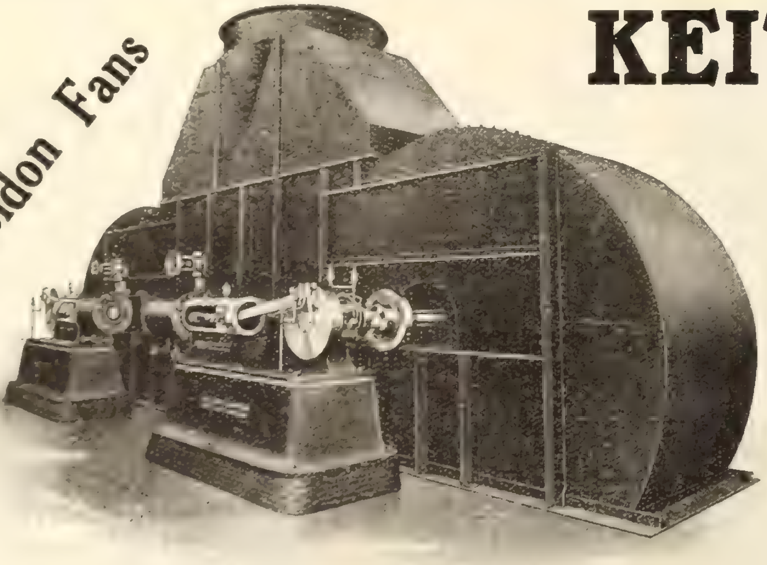

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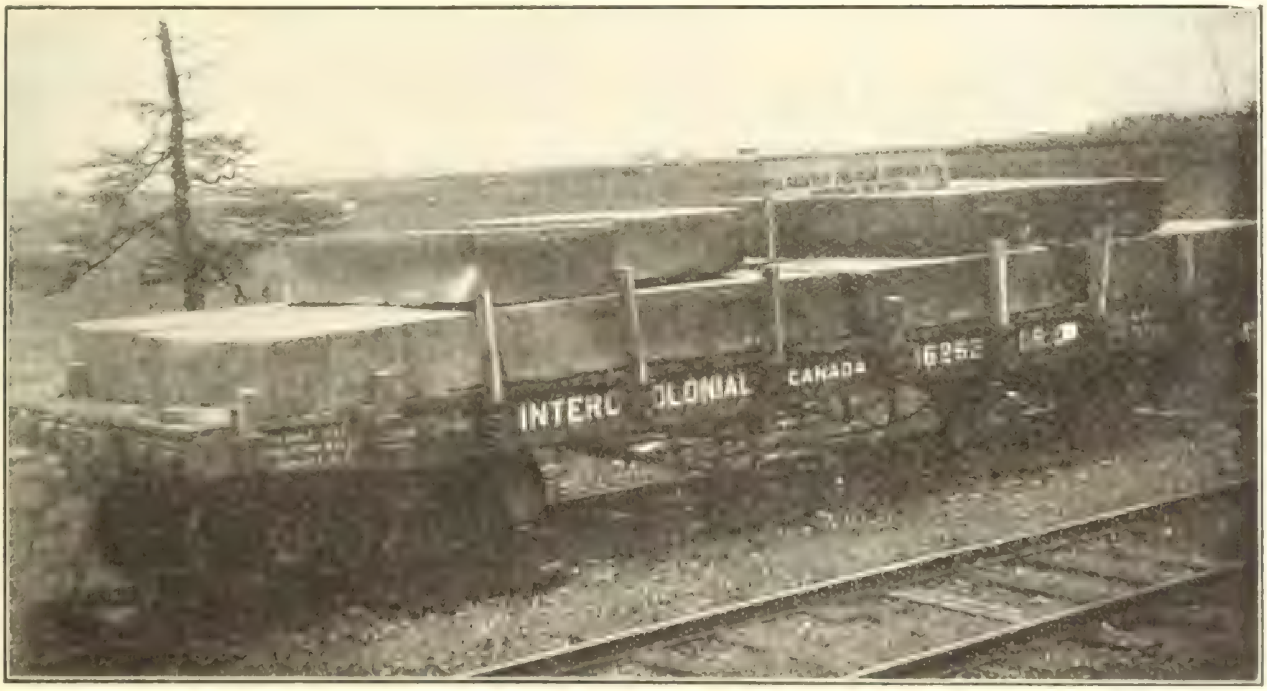

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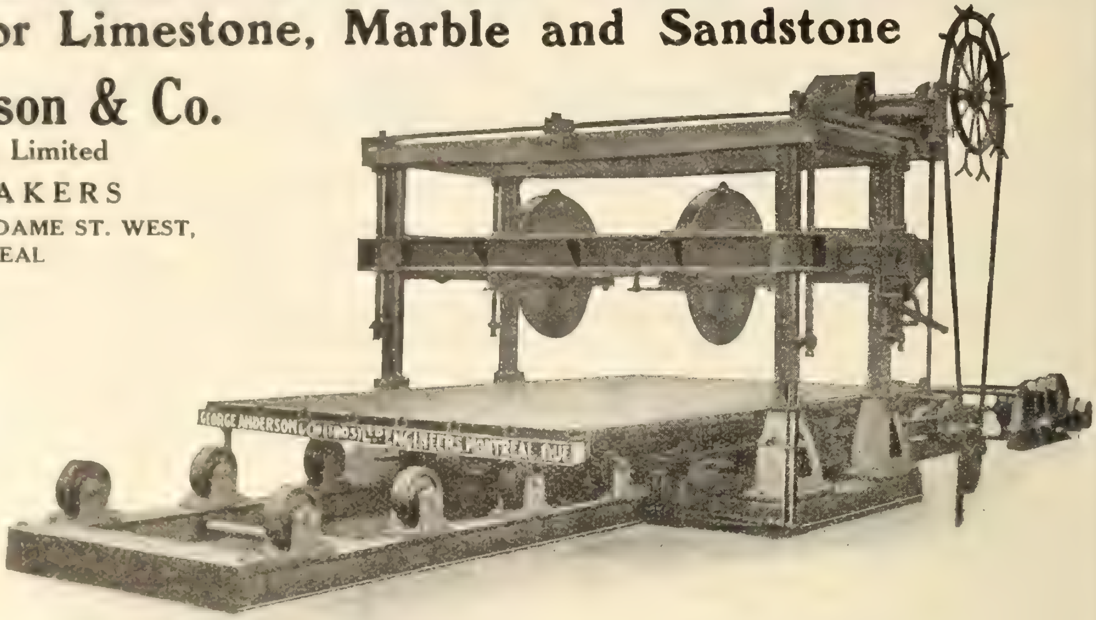

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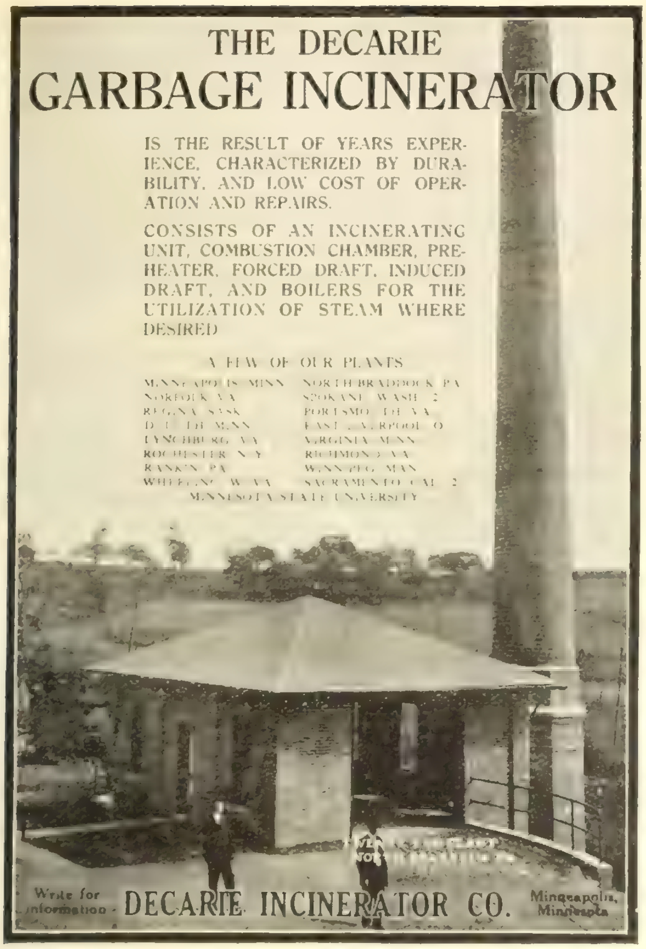

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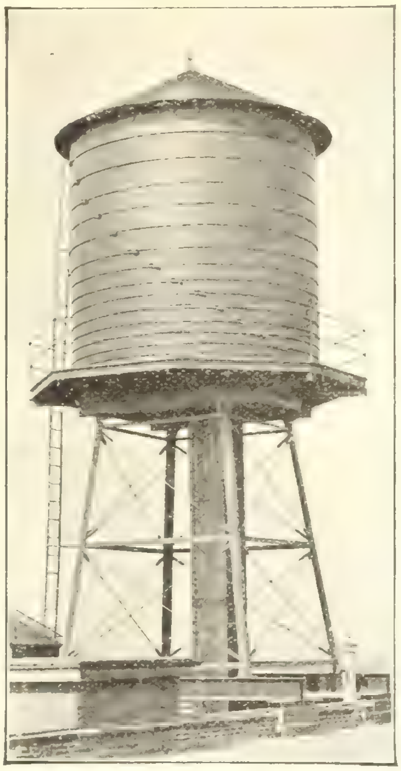

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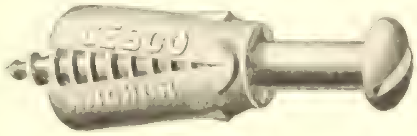

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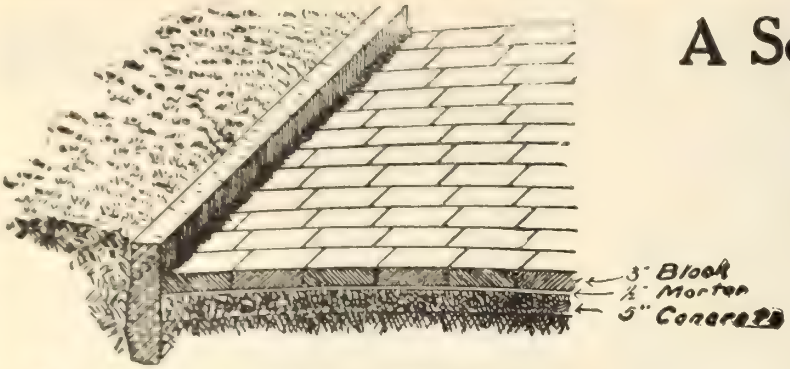

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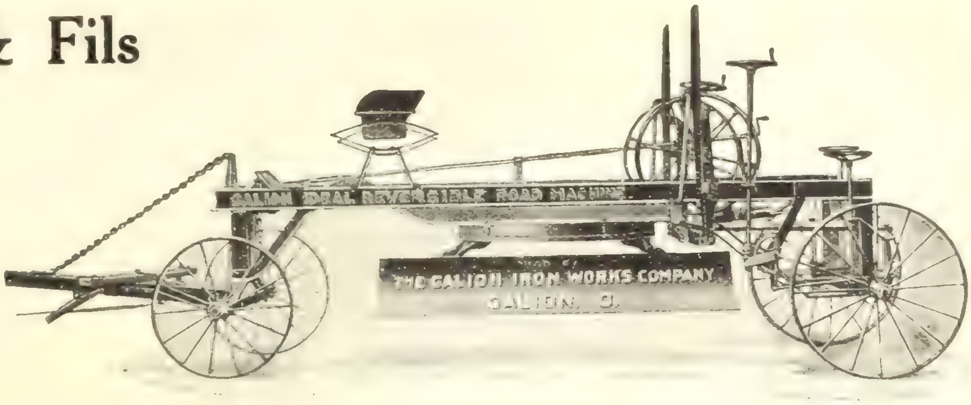
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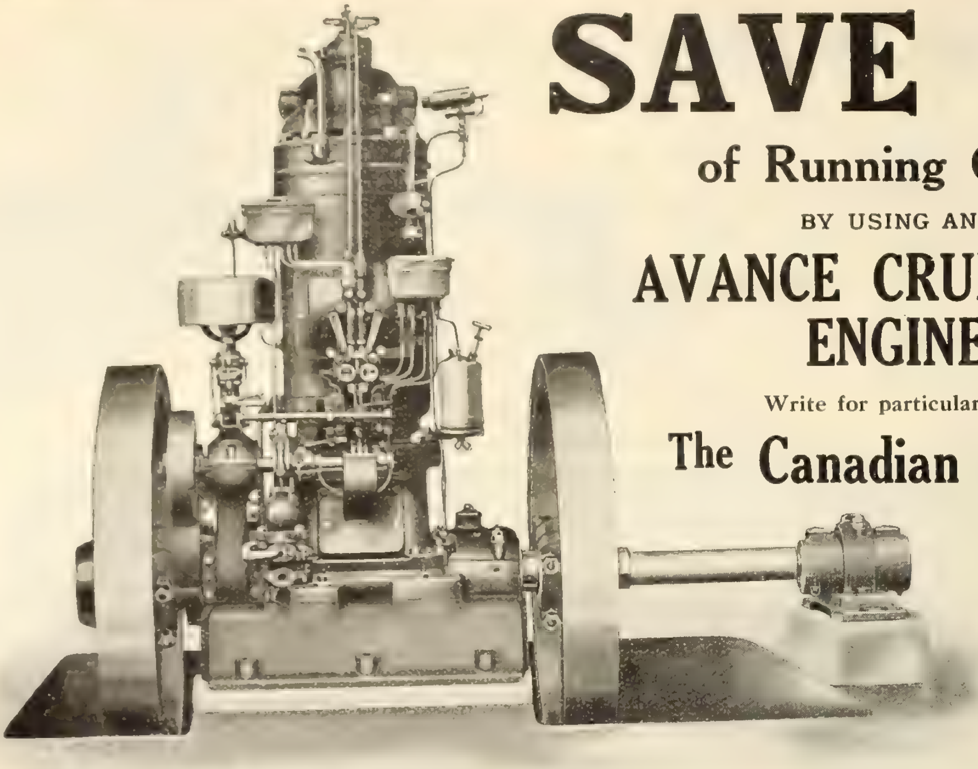

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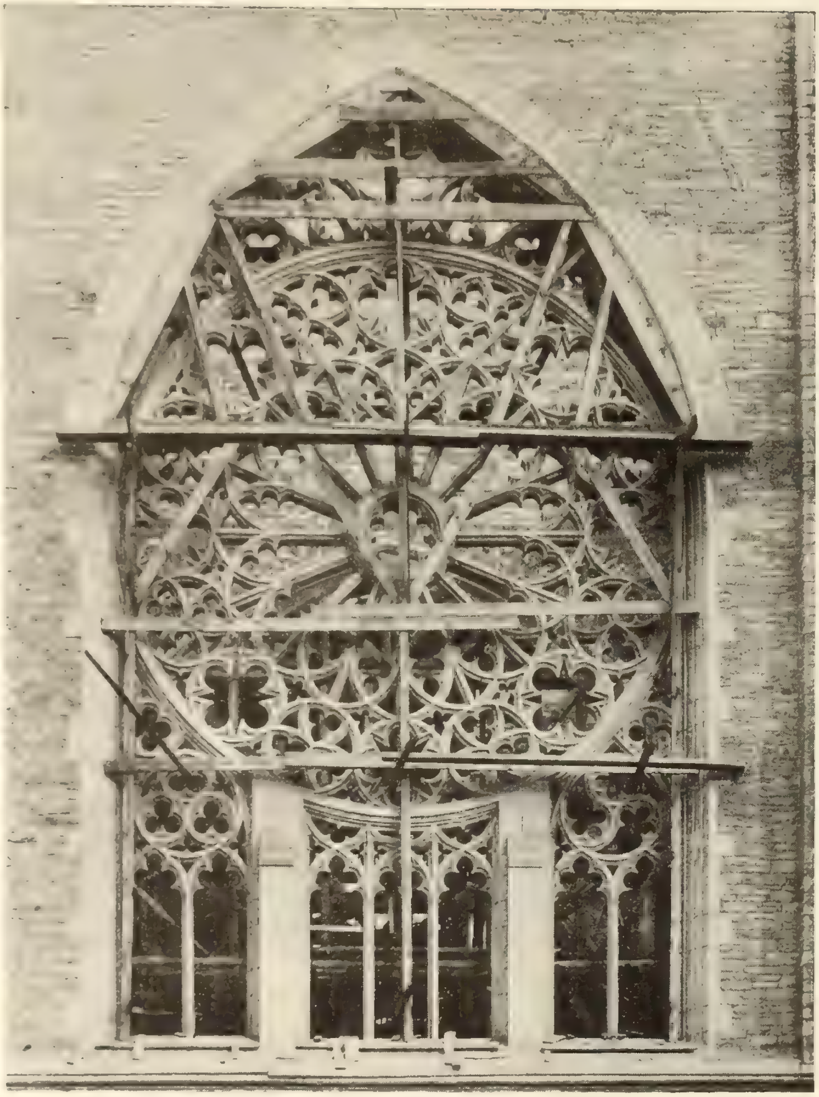

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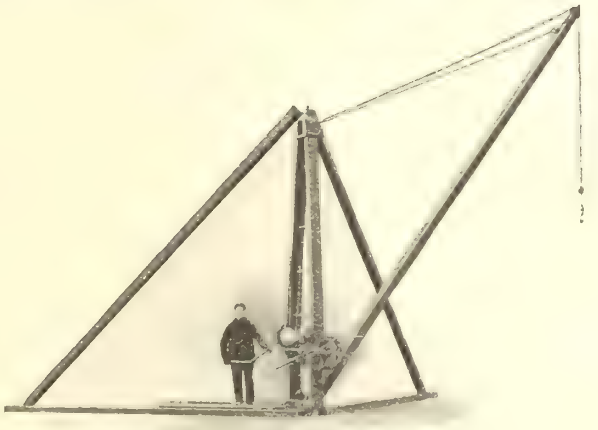

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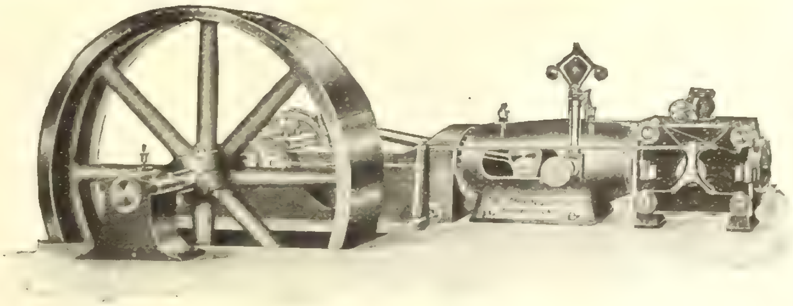

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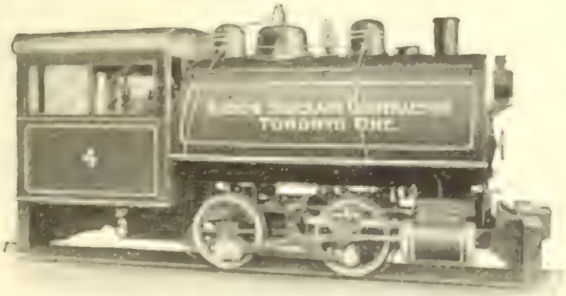

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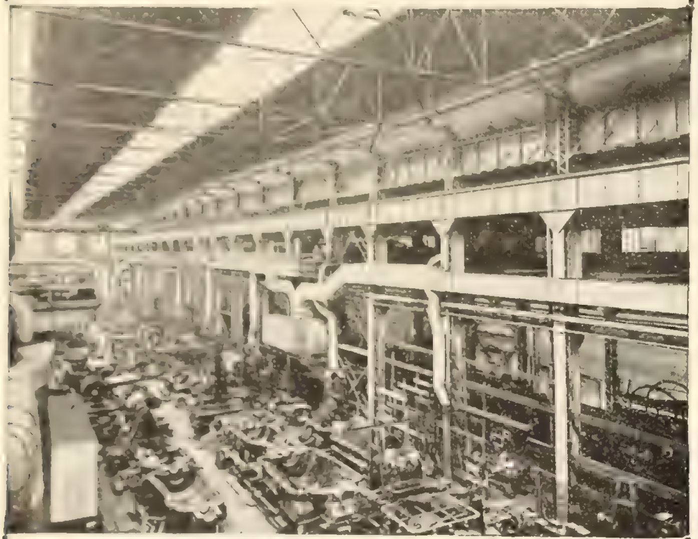

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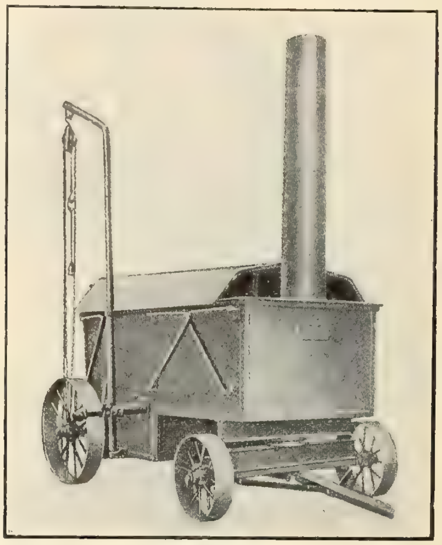

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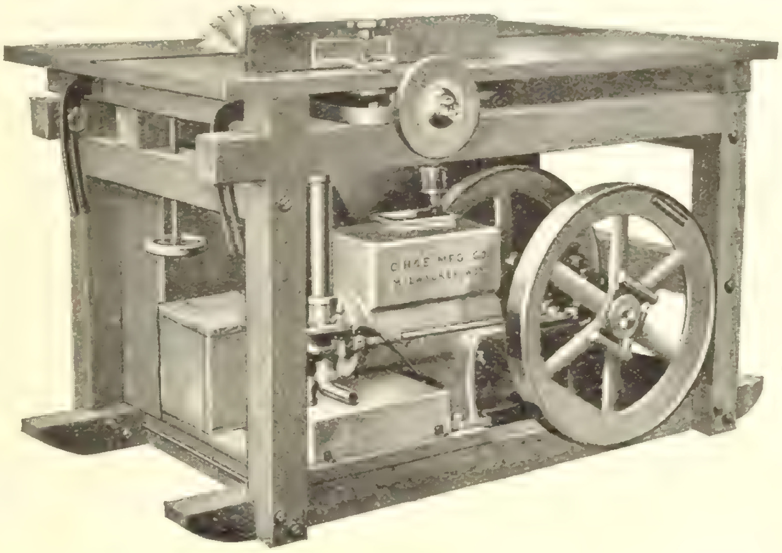

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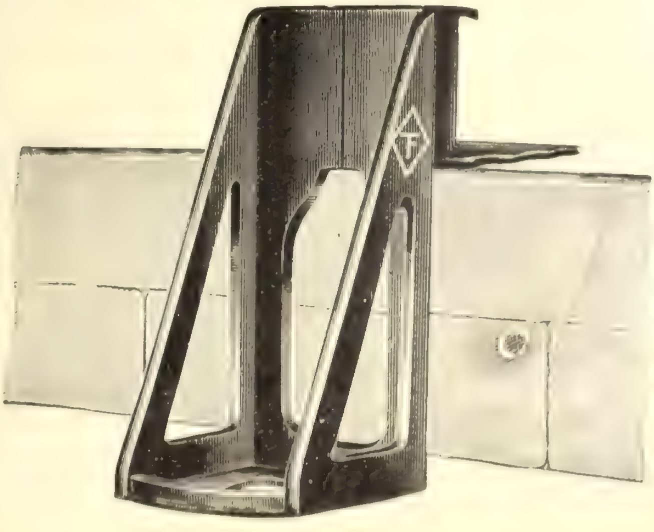

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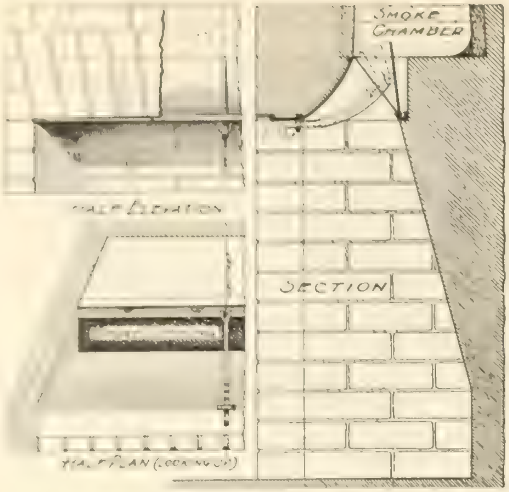

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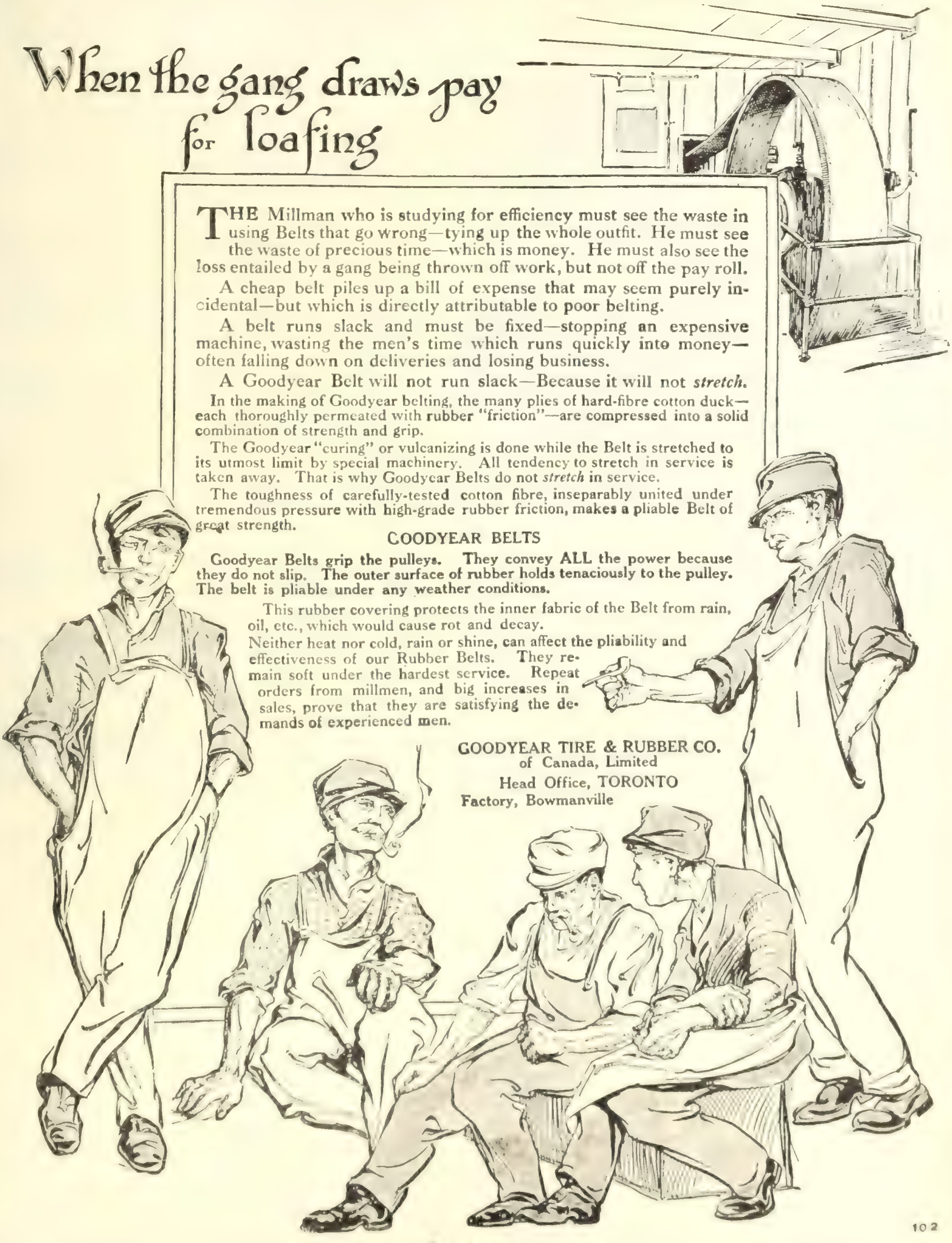

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ESTABLISHED 1886

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A Narrow Policy

"Patronize home industries" is the cry that is often heard nowadays, and while it may be neighborly and a proof of good citizenship if practised up to a certain point, beyond that it is a decidedly narrow policy and very bad business. These remarks are called forth by the action of the Secretary of the Builders' Exchange in a certain western Canadian city, who is launching a movement among the members to procure co-operation on the patronage of home supply men.

"I find that many of the local builders, as well as outside contractors working in this city, have been purchasing supplies from outside men, which is unfair to every citizen," he declared. "Boosting the city is what every man owes his success in business to, and one of the biggest forms of boosting is the patronage of home firms and industries. Every dollar we spend outside the city is just that much business—and boosting—lost to us and gained by outsiders. Every successful man, builder and contractor owes his city a big debt and loyalty demands that all should try to repay it."

The gentleman in question is visiting each member of the Builders' Exchange and taking up the matter personally, urging the patronage of home supply men, and it is his intention at the next meeting of the Exchange to urge that they join the movement for the encouragement of the patronage of local dealers.

We doubt if much can be accomplished by these methods, as every builder and contractor will doubtless wish to exercise his own discretion as to where he can purchase his supplies to the best advantage. It is true that every citizen owes a certain debt to his municipality, which he discharges by paying his taxes and taking an interest in civic affairs. If this system of patronizing home industries were carried to its logical conclusion, it would mean the setting of city against city, to the curtailment of business and the benefitting of no one. The policy that this gentleman is advocating seems to be that of protection, very much overdone. What we require, and must maintain if we are to be active and progressive in a business sense, is absolute and unhampered free trade between the inhabitants of the various parts of this Dominion. The local merchant or supply man, if he is up-to-date, energetic and progressive, and offers the right merchandise at the right price, will always get at least his fair share of the local trade and he possesses this unquestionable advantage over his out-of-town competitors in the fact that he is on the spot. The local dealer can and will look after his own interests and needs no agitation in this respect on his behalf.

Deposits With Tenders and Surety Bonds

In connection with the discussion which appeared in the last issue of the Contract Record on the above subject, it is significant that the little municipality of The Pas, Manitoba, has taken a progressive step. In the advertisement inviting tenders for construction work and supplies, which appears in this issue, it is stated that a marked cheque for five per cent. of the amount of the bid must accompany each tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved surety company.

The following comment on the same subject has reached the Contract Record:

"A representative of a prominent English contracting firm told me that you had been sending out circulars to the contractors throughout Canada asking for information as to methods of bettering the conditions of tendering in Canada. The gentleman in question is an engineer, who has written a number of articles for the London Times, and who says that the system used in Canada of requiring cash deposits from contractors with their tenders, is highly detrimental to the best interests of the business.

"A cash deposit of five per cent., which municipalities usually require from contractors, is too large a deposit to ask the contractors to make simply as a guarantee of good faith that they shall make a tender on receiving copies of the specification, and too small a percentage to ask as a proper guarantee that the contractor will carry out the work. The English method is that the municipality advertise for tenders and requires each contractor who wishes a copy of the plans and specifications, to deposit the sum of $10, which sum is returned to him if he puts in a bona fide tender, but is retained by the municipality in case he makes no tender, and the contractor to whom the work is let must furnish a bond.

"The system in Canada is very backward and absolutely wrong from an economic standpoint and it ties up such an enormous amount of capital in an unproductive manner. I believe that on the dredging contracts for the Harbor of Toronto there are deposits in the neighborhood of $1,000,000 tied up with the city of Toronto, which is quite unnecessary, and especially in times of financial stringency works a very great hardship. That amount alone would finance several new industries for the city of Toronto.

"The ideal method for cities and private parties to properly secure themselves, and at the same time work no hardship on the contractors, is the method which is adopted very largely in the United States with very excellent results, and should apply with extraordinary force to a new country like Canada, where capital is so urgently required. That system carried out in its entirety would mean that these municipalities would advertise for tenders and in the advertisement require contractors asking for copies of the specifications to forward a deposit of $10, said amount to be returned to any contractor putting in a tender. But further, in the advertisement require that every contractor tendering shall furnish with his tender the bond of a guarantee company duly signed and sealed, guaranteeing the faithful completion of the contract, and guaranteeing that they will go on and sign the contract, if it is awarded to them. This does away with the necessity of a cash deposit entirely. Absolute security to the municipality is given and the contractor knows in advance his requirements, and every contractor of good standing can get a line of credit from a surety company. Thus, the vast resources of the surety company, a great many of which are now writing this contract business, and their enormous credit, would be placed behind the contractors, releasing millions of dollars of capital for the development of the legitimate industries of the country, and materially reducing the cost of the work by reason of greatly cheapening the cost of capital to the contractors."

The Brick Salesman

It has been observed that within the last few years that brick buildings, which have recently been erected and which are now being erected, are, as a class, far more artistic than buildings which were erected seven or eight years ago, or even within a shorter time.

This is largely due to the fact that owners have come to realize that the selection of face brick for their office building, store front, residence, or apartment is all important and that the architectural beauty of the building will be ruined and the financial value decreased should a face brick be adopted for use in its walls which is not adapted to the particular type of architecture employed by the designer of the building.

Although, as above stated, the owner's realization of the importance of the proper selection of face brick has played an important part in the bringing about of this advancement toward the artistic in face brick, the potent factor has been the brick salesman, and to him can be attributed not only the betterment of face brick but, also, the increased demand for every clay product that is manufactured.

The opportunities offered the young salesman today in the exploitation of clay products are wonderful and unlimited. There have been, however, exceptions to the statement that the brick salesman has aided in the progress of face brick, but these exceptions are in cases where the heart of the salesman was not in his work, and he occupied his position, not for the advancement of his employer's welfare and, incidentally, his own, but in the pay check which he received monthly. Face brick concerns, better than anybody else, recognize that such a salesman, if he may so be called, is an impediment to the advancement of the clay products industry and, well for that industry, he does not last long.

The brick salesman of today, in order that he may become expert in his line, which is necessary to gain the confidence of his customer, must make a deep and careful study of not only the effects obtained by the different treatments of face brick, but he must be thoroughly familiar with their manufacture and the conditions existing not only at the plant from which the brick that he sells are secured, but also the conditions surrounding the plant of his competitor.

The study mentioned above requires a great deal more time and thought than the simple statement leads one to believe, for the science of brick salesmanship involves a part of the profession of architecture, or, at least, a small knowledge of certain parts of this profession, and an understanding of the trade of brick laying and building construction.

Much more might be said regarding the brick salesman and the essentials required to make a good brick salesman, but, as these conditions are in common with the science of the sale of all articles and go to constitute a good salesman in any line, they need not be spoken of here.

To the young man entering upon a business career, the opinion has been given that he can take no step more for his self betterment and quick advancement than that of entering into the sales department of a reliable concern handling face brick. Such a place is today waiting for every young man who desires to enter this phase of business and all that is required of him is loyalty to clay products and the concern for which he works, together with the usual requirement—integrity.

Responsibility of Architects for Extra Work

In the Superior court, Montreal, Mr. Justice Fortin has given judgment in the case of Pauze v. Doucet, and others, condemning the defendants, a local firm of architects, to pay the plaintiff, a contractor, $219, the price of certain extra work done on a building by the contractor at the request of the architects, but without the authorization of the proprietor.

The plaintiff, on being refused payment of the extra work by the proprietor of the structure, took action against the architects direct, maintaining that as it was on the order of the latter that he had done the extra work it was incumbent upon them to adduce written evidence that the work had been ordered by the proprietor, or failing this, pay the full amount of the extra work. The provisions of the law limiting the responsibility of the proprietor for extra work done in connection with a building in course of erection are explicit, confringing such responsibility only to works the execution of which has been authorized in writing by the proprietor. In the present case, the plaintiff being refused payment of certain extra plumbing work by the proprietor, on the ground that he had never authorized the carrying out of such work, decided to have recourse against the architects. It was on the order of the latter that he had done the work, the architects having written a communication to him, stating that they had received orders from the proprietor to have the work done. The proprietor denied ever having given such order, while the architects said the order was verbal. Mr. Justice Fortin, held that the proof was to the effect that the architects never had any mandate from the proprietor to order the extra work in question. They had seen fit to order the contractor to go ahead with the work, and it was now incumbent upon them to pay for the work which they had ordered.

An appeal has been made to the Court of Review.

Three Transcontinental Railways for Canada

The Ramifications of the Grand Trunk Railway System

DURING the past year the most important addition to the Grand Trunk proper has been the construction of the Chateau Laurier and the new terminals at Ottawa. The Chateau is the first of a system of hotels to be established across the Continent. The Chateau Laurier is considered one of the handsomest hotels on the American Continent. The Fort Garry at Winnipeg will be open to the public in the Autumn of this year and will not suffer by comparison with any other hotel in Canada, with the possible exception of the Chateau Laurier, a great deal of the charm and the grandeur of which is lent by the location and environment. A new hotel will be added to the system and opened to the public annually for the next four or five years.

The work of elevating and depressing the double track line through Toronto, to secure the elimination of all highway grade crossings and the construction of two additional main tracks, is an undertaking which is more than fifty per cent. completed. A part of this undertaking, which will cost several million dollars, will be the construction of a new Union Depot at Toronto. A portion of the entire expense of elevation and depression of the tracks will be borne by the city of Toronto.

At Montreal, new freight terminals have been established on the south side. This has already relieved the congestion in Montreal proper.

At Fort Erie, the Canadian terminal of the international bridge across the Niagara River, a modern classification and receiving yard has been completed to provide for the constantly increasing interchange business with the American trunk lines centering at Black Rock, N.Y. On the Grand Trunk Western Railway the entire main line across the State of Indiana has been equipped with automatic block signals to protect and facilitate the heavy train movement in that territory. New capital is constantly required to provide for these additional facilities, but they are absolutely necessary to take care of the growing traffic. Tracks, terminals, elevators and other facilities are being improved, enlarged and provided for along the east shores of Lake Huron in order to be able to handle the great volume of wheat, constantly increasing as new mileage is added to the Grand Trunk Pacific. New hotels, attractive camps and a system of cottages are being provided for the company's summer resorts in the Highlands of Ontario where summer traffic is increasing rapidly.

Grand Trunk Pacific Railway

While the company have been rushing the rails westward in order to connect at the earliest possible date the Atlantic and Pacific oceans, they have been reaching out with branch lines and feeders. This is of the first importance—to gather in the traffic for the trunk line, to take care of new home-makers, who are swarming into what was, some six years ago, an almost empty West.

An important branch line leaving the main line at Melville, 279 miles west from Winnipeg, is finished northerly as far as Canora, 53 miles, where it crosses the Canadian Northern Railway and heads its way up towards the Hudson Bay. It is intended to push this

Grand Trunk Pacific Railway Elevator, Montreal line northeasterly via Fort Pelly to connect with the proposed Government road to Hudson Bay at the Pas.

Taking this same branch south from Melville the road is completed and Pullman service in operation as far south as Regina, the capital of Saskatchewan, 98 miles from Melville. From Regina the line leads southeasterly towards the boundary, heading directly toward St. Paul and Chicago. Connection will be made at the boundary with the Great Northern Railway, giving a short and almost direct route from Chicago and St. Paul via Regina to Edmonton, the capital of Alberta. Edmonton is the natural gateway to that last new West now being opened by the Grand Trunk Pacific, rich in minerals, rich in agriculture and the products of the forest. When the Grand Trunk main line is completed this will be by far the shortest and easiest way from that great traffic centre, Chicago, not only to the Prairie Provinces and the great new Empire called the Peace River Country, but also to Alaska and the Yukon Territory.

Steam shovel at work on the main line of the G.T.P.

From Watrous a branch line is now being built to Prince Albert on the northern boundaries of the wheatfields and the southern fringe of forest and lake-lands that sweep northerly to the barrens. A short line has been completed northerly from Biggar, the fourth divisional point west from Winnipeg, to Battleford, at one time capital of the Northwest Territories and headquarters for the Northwest Mounted Police. Leaving Battleford this line will be extended through the Cut-Knife country, a very rich agricultural district, swinging directly northwest. This branch will parallel the main line, at a distance of some fifteen to twenty miles, all the way to Edmonton. Every mile of this line traverses productive territory.

Still another and a very important line leads southwesterly from Biggar to Calgary. This branch is already completed as far west as the eastern boundary of Alberta. This will give Calgary not only a new through direct line to Winnipeg and the East but one of the shortest and best lines yet built or projected. From Tofield, just east of Edmonton, a line drops almost due south to Calgary, the commercial metropolis of Southern Alberta. It is expected that this branch will continue south, touching the international boundary at Coutts, Southern Alberta, with a branch leaving this line north of Lethbridge running almost due west to the Crows Nest Coal District.

At a point some fifty miles northwest of Moose Jaw that line runs almost due west into the Province of Alberta swinging northwest to connect with the Biggar-Calgary line. Dropping southeast, near the western boundaries of the Province of Saskatchewan, an off-shoot of this important line drops into Medicine Hat, swinging directly northwest from that promising town to Calgary. A short branch has been projected from Kinsella, west of Wainwright, southeasterly to tap the Tofield-Calgary line at Bullochsville, near Red Deer, Alberta. It is the intention to run another line nearly west from Regina passing Cyprus Hills to connect with the Tofield-Calgary-Boundary line at Lethbridge, where they reap great crops from the surface of the earth and mine millions of tons of coal from below. A branch is now being completed by a friendly company due northwest from Edmonton some 300 miles to Grande Prairie and the Peace River country. A coal branch is already in operation south from Edson to Mount Park, 67 miles.

Last, but not the least important, is the Pacific Great Eastern, connecting Vancouver with the main line of the Grand Trunk Pacific at Fort George. This will give the Grand Trunk Pacific, in addition to its principal port, Prince Rupert, another outlet to the ocean at Vancouver. The great natural harbor of Prince Rupert, opening southwest to the sea, has a clear entrance half a mile wide expanding to one mile in width, and is nearly fourteen miles long. Overlooking this harbor a palatial hotel will be completed within the next two years. A line of ocean steamers is to be operated on the Pacific, connecting Prince Rupert with the principal ports of the Orient. Here, too, will be built a 20,000 ton Pontoon floating dry-dock, with its necessary launching platforms, power house, coal-handling equipment, shops, etc.

Less than four hundred miles of the main line remains to be graded before the company can connect the eastern end with the steel, which already reaches up two hundred miles from Prince Rupert.

Unlike any other Transcontinental Railway, the Grand Trunk Pacific is being completed to specifications—mile by mile, so that when the last spike is driven the road can immediately be opened for traffic from ocean to ocean. This railway has been so designed that a locomotive can couple into a train at Halifax or St. John and run away to the Pacific, if need be, without help or a helper. The uniform gradient westward is four-tenths of one per cent. or a rise of 21 feet to the mile.

It has been remarked that a train travelling at the rate of speed of the International Limited, which goes from Montreal to Toronto every day in the year, 333 miles in 7 hours and 30 minutes, making 10 stops, will cross from ocean to ocean inside of four days. On the supposition that the company have Atlantic liners running between European ports and the Atlantic terminals, making the time made by the Lusitannia, the company can take traffic from England to Prince Rupert inside of seven days, and when a passenger puts to sea at Prince Rupert he is 483 miles nearer Yokahoma than any other Pacific port. On the further supposition that the company have equally swift liners on the Pacific, it is within reach and reason to say that with the completion of the Grand Trunk Pacific they will shorten the run around the world by at least one week.

The C. P. R. System

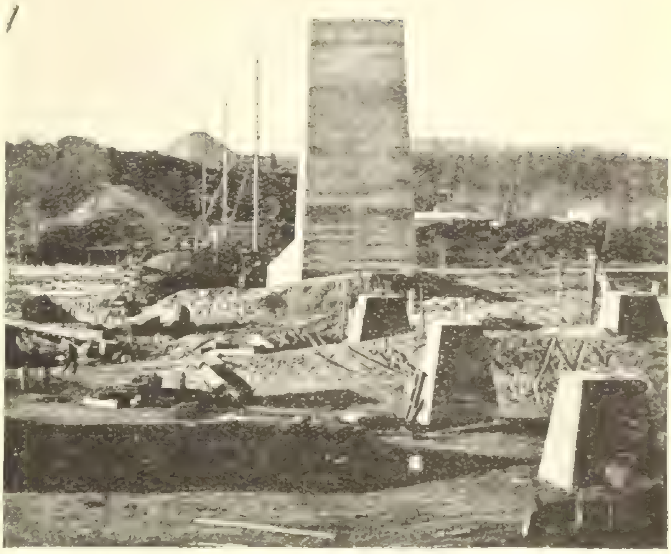
The mere construction of the Canadian Pacific, first transcontinental line across Canada was a small undertaking as compared with the work that has been carried out during the last five years, or even compared with the present works already in hand for which appropriations have been made. As years passed by it was apparent that improvements would have to be carried through and never once has the company let up, so to speak, in its endeavors to improve the immense system.. Millions of dollars are appropriated every year for extensions in various parts of the country, and thousands of acres of fertile soil are brought within easy distance of the railway. The farmers of the Northwest look with considerable eagerness to the annual appropriations, for they realize what it means to secure steam traction within reasonable distance of their crops. Apart from the railway transportation, there is the steamship service, not only on the Pacific and Atlantic, but also on the great lakes and British Columbia coast.

The irrigation work in the vicinity of Calgary and other portions of the west involve over fifty millions of dollars, and, when this is swallowed up, the Natural Resources Department will be able to secure a further sum for the work which is being carried out for the benefit of settlers in the west. The hotel system, stretching from the Atlantic to the Pacific, has also become famous and annually millions of dollars are spent on improving and extending the long chain of hostelries.

The C. P. R. builds its own locomotives, and as much rolling stock as it is possible, in its huge shops at Montreal and Ogden, near Calgary. Apart from the work that is turned out in these shops, however, where no less than ten thousand men are employed, last year one order for rolling stock alone amounted to $48,000,000! This is an enormous sum for one corporation to spend in a twelve month. The new equipment ordered including 467 locomotives, 26,653 box cars, 636 flat cars, 401 coal cars, 300 stock cars, 227 refrigerator cars, 94 first class sleepers, three compartment cars, 20 observation cars, 25 diners, 57 tourist cars, 117 first class and suburban cars, 138 baggage, mail and express cars.

The equipment of the company on June 30, 1912, was as follows: locomotives 1,820, first and second class passenger cars, baggage cars and colonist cars 1,841, first class sleeping, dining and cafe cars 369, parlor cars, official and paymaster cars 75, freight and cattle cars all kinds 61,446, conductors' vans 1,065, boarding, tool and auxiliary cars and steam shovels 4,254. This number has been greatly augmented, however, since that date. The number of steamships plying on the Atlantic, Pacific, British Columbia coast, lakes and rivers is 76 all told, while four vessels are under construction.

The appropriations for the work to be carried out during this summer on the eastern lines involve an expenditure of $16,000,000, but all this is not to be spent on new work; ten millions of dollars of the amount will be expended in the completion of the works commenced last year, including a portion of the new Lake Shore line and the extension from St. Johns to Farnham Junction, in the province of Quebec. The majority of the new work for which appropriations have been made is principally double tracking on various parts of the eastern lines, and this will involve the expenditure of nearly six millions of dollars. The main line from Islington to Guelph Junction on the London sub-division will be double tracked for a distance of thirty miles, which is necessitated by the increase of traffic and will prove a considerable relief to the congestion on this subdivision. It is contemplated to have the work finished by November.



Clover Bar Bridge under construction on the G.T.P

It is proposed to double track portions of the main line between Romford—which is the junction between the main line and the Toronto-Sudbury branch—and Port Arthur, covering a distance of 135 miles. The total distance between these two points is 553 miles. Last summer seventy-five miles of this line were double-tracked at the points which most facilitated operation of traffic. It is intended to eventually double track the whole of this long stretch and when completed it will be a great advantage to the haulage of grain after navigation on the great lakes is closed. An-

Power House, Clair Tunnel, Port Huron.

Other important work to be commenced this year is the double tracking of a small stretch of fifteen miles between Agincourt and North Toronto. Apart from the work of erecting two steel viaducts over the Don Valley, the work on this line is by no means heavy. The other work to be finished this year includes the Interprovincial and James Bay Railway extension from Kippawa northerly, grade revision on the Soo branch from Algoma to Sudbury and the Lake Shore line from Glen Tay, on which work is well under way and which it is expected will open for traffic in December next. This latter will create a double track between Montreal and Toronto.

The western appropriations included 532 miles of new lines to be built and 280 of double track. Last year many new branches were put in operation and others remained incomplete. These will be finished this summer and additions made. The C. P. R. is pushing the construction work as rapidly as possible in the west, but it is impossible to keep pace with the thousands of acres of new country opening up every year. Before twelve months are over the C. P. R. will have spent not far short of a hundred millions of dollars on construction work in the west. Nor does this vast sum represent all the money the C. P. R. will spend. The Natural Resources Department has huge undertakings in the west, as already mentioned, which will involve several more millions, while the main work to be started is the tunnel through Rogers Pass, which, it is estimated, will cost slightly less than eight millions of dollars. The tunnelling of the Selkirk Mountain will lower the grade considerably and give the company a double track to the coast. The work of double tracking will be pushed ahead with all possible speed until the company will have double lines from the Atlantic to the Pacific. Work is already in hand in connection with the great terminal at Vancouver, which will cost two and a half millions of dollars. In Winnipeg another two millions will be spent and the work on the Montreal Windsor street station is about completed, but further alterations and additions have yet to be made which will take considerable time. The bridge construction which the company has in hand in various parts of the Dominion is another important department, involving millions of dollars.

The orders placed through the purchasing department in 1912 for equipment and supplies required in connection with the business of the company approximated about eighty-five million dollars, and the payrolls during the year averaged five million dollars per month. Recently Sir Thomas Shaughnessy, the president of the C. P. R., said that "Few people who have not got to deal with the figures from day to day realize what they mean. To spend eighty-five million dollars on equipment and supplies in one year is a big undertaking, and when you have to hand your paymaster five million dollars every month to pay your employees you have got to be pretty prosperous, or you will occasionally be short of funds, but the company has a great many men to pay, ninety thousand of them, pretty regularly, and at times quite twenty thousand more. To pay ninety thousand men every month naturally requires a very large sum of money, but fortunately the revenue of the company is such as to warrant it, and in addition to give the company's credit such a position in the financial markets of the world that the vast sums required for capital expenditures are secured with a comparative degree of ease.

Construction on the C. N. R.

From every construction camp of the Canadian Northern Railway satisfactory progress reports are issuing regularly of the strides taken in the linking together of the line, that will give to that company a main line from tide-water at Quebec in Eastern Canada to Port Mann and Vancouver on the Pacific Slope. With every mile under contract, big gangs of men are established at convenient intervening points, throwing up grade or laying rails. These are being steadily augmented and the road's executive is confident that the last spike marking the conclusion of their mighty task will be driven before the end of the present year, or at the latest, very early in 1914.

To properly comprehend this work the location of the various networks of line now comprising the C. N. R. system must be understood. The transcontinental line must connect, directly, from east to west, the cities of Quebec, Montreal, Ottawa, Toronto, Port Arthur, Winnipeg, Edmonton and Vancouver. Until the Canadian Northern began to build, it was the general custom of railway companies with large ambitions in Canada to begin in the east and extend westward. The Canadian Northern, however, was a product—and a most remarkable product—of the Western Canada prairies. Its first line was built in Manitoba in 1896. It extended from the small settlement of Gladstone, for one hundred miles through sparsely settled territory to a point then unnamed and which is now the thriving town of Dauphin. Since 1896 the lines have spread over the three western provinces of Manitoba, Saskatchewan, and Alberta, a veritable network, totalling more than 4,500 miles with Port Arthur on Lake Superior as the eastern end, and Edmonton in Alberta the western.

In Eastern Canada, in Ontario and Quebec, there are two smaller clusters of lines; the Canadian Northern Ontario, in the province of that name, and the Canadian Northern Quebec. The first includes a line from Toronto north to Sudbury and beyond to Ruel, and a line east from Toronto through the old towns of Port Hope, Cobourg, Trenton, Belleville, Deseronto, Napanee, and so on, toward Ottawa, and Montreal. There are, of course, a number of smaller feeding lines. The system in Quebec province comprises a line from Montreal to Quebec city, Montreal to Ottawa, Ottawa to Quebec and from Quebec north to Lake St. John, and the headwaters of the Saguenay River, through the Laurentide Mountain chain. In the province of Nova Scotia there is the Halifax and Southwestern Railway, popularly known as "the road by the sea," as it serves the Atlantic coast line from Yarmouth, where connection is made with Boston steamers, to Halifax city. The whole chain comprises more than 2,000 miles.

Before the C. N. R. could become a transcontinental line in the fullest sense of the term it was necessary to connect these systems. To do so it was incumbent on the company to build between Ottawa and Toronto, and between Ottawa and a point on the existing C. N. R. line, from Toronto to Sudbury. A line was to be constructed westward from Sudbury to join these eastern lines with the western at Port Arthur. Between Port Arthur in Ontario and Edmonton as already shown the company is operating its ramification of lines. But to allow the Canadian Northern Transcontinental trains to reach Vancouver a line had to be laid through the Rocky Mountains, and on down through the valleys of the North Thompson and Fraser Rivers to the rising young cities on the British Columbia coast.

So three links were needed to give the C. N. R. a line from Ontario tide-water at Quebec to Pacific tide-water at Vancouver. These were the three; one from Edmonton to Vancouver, 770 miles; Sudbury to Port Arthur 545 miles; Ottawa to Toronto, 250 miles. These had to be built simultaneously and although active construction on these three had been in progress for only two years or so, sufficient progress had been made to justify the assertion of the company that the line will attain its status as a transcontinental by the end of this year. The standing of construction to date given below will show that statement to be warranted.

There remains but twenty-three miles of track to be laid between Ottawa and Toronto. The grading is practically completed, and the bridges finished, with the exception of one, at Chaffey's Locks. That line connects Quebec, Montreal, Ottawa and Toronto.

From Sudbury west, 74 miles of rails are down and the grade completed ahead sufficiently for to allow of steady track laying. From Port Arthur eastward to meet this, the steel is in place for 98 miles and the grade is in shape for 150 miles. Then from Oba, a point almost midway between the towns of Sudbury and Port Arthur, gangs are working both east and west, and steel has been laid for 22 miles toward Port Arthur. There are only two bridges considered big—one crossing the Nipigon River, and one at Blende River. Nearly all of the structures remaining are up and ready for the rails. The C. N. R. construction men state very positively that this entire line will be finished before December 31st.

Work is actively proceeding at several places along the right of way from Edmonton in Alberta to Vancouver in British Columbia. By the end of July it is expected steel will be laid to Allreda summit, through Yellowhead Pass, which is 350 miles west of Edmonton.

Westward from Port Mann, down at deep water on the Fraser, grading and bridge work is so far advanced that the track-layers should be at Kamloops, 243 miles of the way to Yellowhead Pass, by the end of December. Track is being laid east from Yale. More than thirty per cent. of the grading between Kamloops and the line reaching Vancouverward from Edmonton has been finished. Early in June active work will be commenced on the line from Port Mann to New Westminster. This is but a short distance and a part of the railway into Vancouver, the entrance to which city will include a tunnel four miles long to False Creek Flats where the C. N. R. Pacific passenger terminals will be located. It should be mentioned here that the company is securing entrance to Montreal in Eastern Canada also by a tunnel bored through Mount Royal to big terminals located in the heart of the business district of the city.

In Vancouver the company recently secured the consent of the municipality to go on with the work at False Creek. Engineers are surveying the area now. The final accomplishment of this undertaking will mean much to Canada in particular, and to the North American continent in general.

A Modern School Building at Regina

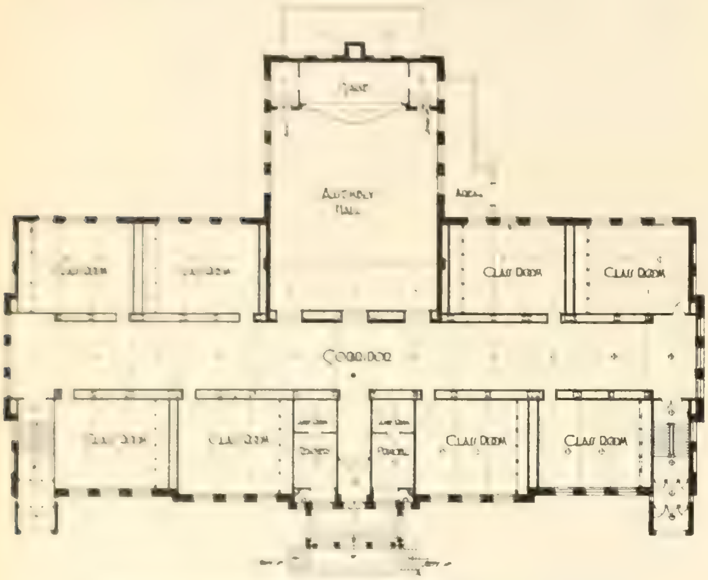
THE accompanying illustrations show the Wetmore School, the largest and most recent school in Regina, Sask., now under construction. The dimensions of the building are 194 ft. x 79 ft. 6 ins. It is two storeys in height with a full basement storey, set well out of the ground. The construction is fireproof throughout, in reinforced concrete, with iron staircases and asphalt treads. All the partitions in hollow tile. A feature in planning is the large assembly hall on the ground floor. This is two storeys in height and with its raised lantern roof will result in a lofty interior effect. The corridors are of unusual width to facilitate drill and marching exercise.

Ventilating, plumbing and heating are of the latest design. The heating is on the vacuum system with automatic temperature control. The building is equipped with the Spencer turbine vacuum cleaning system installed along with plumbing, heating and ventilating equipment by Messrs. Potts & Smith, of Regina.

The Wetmore School, Regina, Sask

The sheet metal is being executed by Armstrong, Smith & Dowswell, Regina, and the electrical work by Messrs. Whiteford Bros., Regina.

Mr. S. S. Kennedy, of Winnipeg, is acting as consulting engineer on the machinery equipment and the general contractors are Messrs. Wilson & Wilson, of Regina. The total amount of the contracts is $166,870. The plumbing, heating and ventilating amount to an additional $35,600, making a total cost of $202,470.



Ground plan of the Wetmore School, Regina, Sask.

WRECKING a concrete grand-stand by the aid of a derrick and a 3,000 lb. pile driving hammer has recently been accomplished in Cincinnati. After the slabs and beams were wrecked the steel reinforcement was cut with an oxy-acetylene flame, making easy the removal of the various members. The grand-stand was built in 1901 and according to the contractor in charge of the wrecking the steel reinforcement was found to be in perfect condition.

London Makes Brick From Refuse

It has been demonstrated in London that brick can be made by utilizing the city's refuse, and the introduction of a similar system in American cities already has been given consideration, especially in Philadelphia. The London refuse destructor consists of a series of furnaces whose only fuel is refuse of every conceivable kind. Garbage, ashes, street sweepings, dead animals, bones and offal, excelsior, paper, crockery, glass and cans, all are thrown into the furnaces. The ashes into which they are finally turned are manufactured into a brick, which is said to be of exceptionl quality, having a hard surface and capable of sustaining heavy pressure.

At the congress in London, 1906, where it was discussed for the first time, a very great future was prophesied for the use of this material in architectural work. At the later congresses in Vienna and Rome great attention was paid to reinforced concrete. One of the results of these discussions is, it may be fairly assumed that in Europe (at all events) not a theatre, church, school, hospital, post office, greater railway station or other public building is erected in which the proper reinforced concrete is not used to a large extent.

A Modern Church

A CONTRACT will soon be let for the Dominion Methodist Church and Sunday School, to be built at the corner of the Boulevard and Roslyn avenue, Westmount, P.Q., from designs by Badgley and Nicklas, Cleveland, Ohio. The architectural style is English Gothic, and the estimated cost $225,000.

The foundations will be of concrete and the interior of fireproof construction, reinforced concrete with steel beams and girders being employed, while the roof of the church will be carried on steel trusses. The interior finish will be of red oak or white pine, and maple will be used for the floors. Art glass is to be used for all windows, all frames being of cut stone with metal sashes. The roof will be of copper. Beneath the auditorium a gymnasium is to be constructed, while provision is also made in this basement for entertainment rooms, boys' and girls' lockers, shower baths, choir room, club room, etc.

The Sunday School (which is located in the front portion of our illustration) is connected with the church by means of a corridor. It consists of a main hall, with extensive galleries running round three sides and a room beneath this. A feature is the use of accordion doors fitted with large glass panels, on the galleries and main hall, enabling separate class rooms to be formed, in half a minute. Thus after the opening service, when all the scholars are present, the doors are brought into use; and at the close of the lesson, the doors are removed and the school is once more made into a general assembly. Altogether 17 class rooms can be formed. On the ground floor of the school the plans provide for check room, toilet rooms, bowling alleys, and a boiler room, with heating and ventilating plants. There are to be three boilers operated on a gravity plan. The heating will be by means of direct and indirect systems.

Dominion Methodist Church, Montreal.

The church will accommodate 1,000 worshippers and the Sunday School 1200 children. A janitor's house, containing seven rooms, is also to be constructed, the style of the building harmonizing with that of the church and school.

Mr. H. Barr is to be the superintendent of construction.

Road Pavements on the Pacific Slope

Profit by Old-fashioned Mistakes—Treatments Suitable to Climate—Macadam Roads Do Not Last

By T. S. Scott, Vancouver, B.C.

Bitulithic Paving on Marine Drive, Vancouver, B.C.

THE request for "an article" on the pavement conditions on the Pacific Slope when one realizes what the result would be, must be declined, for it would be impossible to compress into this article any valuable engineering information covering a territory so vast. It would result in volumes drier than the driest western deserts. What may be attempted, however, are a few observations on what is being done at some centres and on some highways.

Except that the people are bold and progressive and quite ready to spend large sums in improvements, provided the large sums are borrowed in the East and payable in the future, the situation is similar to that in the East.

The engineers are as usual, conservative, like the doctors, and quite consistently are copying the same old-fashioned mistakes as well as the good points of that rara avis, the man who made the original specification, which every engineer (so-called) is copying. Occasionally some "easy mark" is brow-beaten by an unscrupulous contractor, operating through a council or otherwise, to throw over-board a really well-tried and proven specification, such for instance, as the binder between the foundation and the surface of sheet asphalt, or other asphaltic mixtures of fine aggregate, miscalled "asphaltic concrete."

We have had to go through the same experience as the eastern cities did regarding pavement on track allowance, but are now putting in almost enough thickness of concrete slab under the ties, and enough wood cushion under the rails to give a pavement at least a fighting chance.

This more permanent track allowance foundation may result in more of the sheet pavement type being used on account of its freedom from noise, as compared with the more expensive granite block. A great deal of stone block pavement has been laid in San Francisco, Portland, Oregon and Seattle, Washington—granite, basalt and sandstone being used. The latter makes a good pavement on very steep grades where the team traffic is not too heavy. With us on the Coast, the motor trucks are getting so numerous that interurban roads demand attention for the new service they must perform.

It is here that we differ from the east. We have no frost for a winter foundation, and a road which may be firm, though dusty in summer is a morass with us in winter.

In the future when the local cement mills meet the eastern prices it may be economical engineering to design concrete foundations for interurban roads, but at present with cement around $2.45 per barrel, it looks like too much capital outlay. The money cannot be found.

Experience in San Francisco and other coast cities corresponds with all eastern experience, that no block pavement, whether granite, wood, brick, etc., will stand except on concrete. This necessity for expensive concrete foundation, added to the initial high cost of brick, granite or wood block seems to put these types out of the running for interurban work even more than it has in the east.

There has been a large expenditure in California on careful oil and bituminous treatment of macadam. This, in some instances, has had a certain measure of success, but a commission recently investigated the whole question in California and reported against

Bitulithic Paving on Georgia Street, Vancouver, B.C.

these treatments, as after all not of a sufficiently permanent nature to warrant big bond issues to pay for them. Treatments, moreover, suitable to climates as dry as California, are not necessarily at all suitable for Oregon, Washington or British Columbia with their steady winter rains.

The solution must be found in something permanent which uses the minimum of high priced ingredients like cement, and the maximum of local products, thus reducing transportation costs.

This at once runs us up against that "bete noir" of the superficial thinker, a patent. It seems that some twelve years ago one, Warren, patented a process for carefully reassembling a coarse aggregate so as to eliminate the voids, achieving at the same time inherent stability.

This aggregate is preferably made of the highest quality of trap rock, but that not being available, good results in proportion to the quality of aggregate may be obtained by using any local stone or even gravel. By adding 8 per cent. to 10 per cent. of bitumen, which is a coast product, it is quite practicable to lay a "permanent" pavement on a foundation of mother earth.

A great many engineers may doubt that statement, but no observant engineer who has opened the streets of Portland or some of the bitulithic streets outside of Vancouver doubts it at all.

One of the illustrations shows a scenic drive through a forest. This is only a 1½-in. surface laid on 3-in. of bituminous concrete composed of gravel and bitumen. On this latter 3-in. foundation 7-ton Mack trucks carrying actual weighed loads of 13,140 lbs. operated prior to placing the 1½-in. surface. It is evident that if trucks weighing, with their load, about 12 tons, operate without damage to the road—the road being only 4½ inches thick, the Pacific Slope road builders have made a distinct contribution to the science of road building.

The sub-grade should be properly prepared, but only as well as it ought to be prepared and is ordinarily specified for Portland cement concrete.

It would not be fair to the readers of the Contract Record in a general article to attempt a disquisition on a pavement in the competitive market, as it would necessitate equal treatment to the other four first-class pavements, all of which—sheet asphalt, brick, wood block and granite, have been both well laid and villainously laid on the coast. The only reason for the special reference to bitulithic is as explained above, its ability to stand on a foundation without Portland cement, as first demonstrated on a million yard scale on the Pacific Coast.

The macadam roads on the coast have even less chance for their life than those of the east. The summers being comparatively dry the binder is lost, and there being no steady frost in the winter the rain and traffic soon ruin a road which has a large percentage of voids. Less and less macadam will of course be laid, but since there has been a large outlay on such construction it behooves engineers to save what they have. Efforts to do so by oil of various kinds are made in most places with generally unsatisfactory results.

In Portland, Ore., some such streets have been "redressed" with bitulithic and that treatment is being considered in British Columbia.

Mr. MacPherson, Municipal Engineer of Burnaby, a large district between Vancouver and New Westminster, has advised his Board of Works to put such a waterproof cover on eighteen miles of interurban thoroughfares which are otherwise going to be absolutely ruined within a few months. This redressing will be only 1½ or 2 inches thick, laid on the present macadam, cleaned and slightly roughened where necessary, or in some cases trued up by the addition of one or more layers of 2-inch to 3-inch stone.

Summing up, one might say that the outstanding feature of the paving business on the coast is the steadily increasing use of bitumen. This seems a logical, and looked at from the viewpoint of national economies, a proper trend.

It surely is wise to use, if possible, a local "aggregate" which is of little intrinsic value. This is accomplished by the use of local rock or gravel, of which most of the coast countries are full.

At the risk of creating a monopoly the Conservation Commission should consider asking for legislation to prevent wood block industries being promoted.

It may be true that a wood block pavement is a good pavement, though expensive; but after all, since there are admittedly several substitutes, should not the governments of the United States and Canada exercise some supervision over what amounts to an abuse or misuse of a material. There is no doubt that there is a limit to our American timber resources which should be preserved for house building and joiner work of all kinds for which there is no present substitute for wood. There seems to be practically no limit to our rock and gravel, shale and clay. If it were waste wood which could be used for paving purposes it might be allowable, but the fact is, good sound wood is specified.

The life of wood in its proper place is from thirty to a hundred years, but in a pavement, only from ten to fifteen. Present wood block industries, of course, must be protected or compensated, but no more should be permitted to abuse a national resource.

Uniform Contract Form Wanted

Mr. I. H. Scates, Secretary of the Baltimore Exchange, and also of the National Building Trades and Employers' Association of the United States of America, has sent out a circular letter to all kindred organizations requesting united action in the direction of securing a uniform contract form for the use of contractors. The purpose is stated to be as follows:

"To accurately define and standardize wherever practical, plans and specifications in order to eliminate unnecessary hazards and uncertainties in construction contracts."

"To reduce the cost of improvements to the owner."

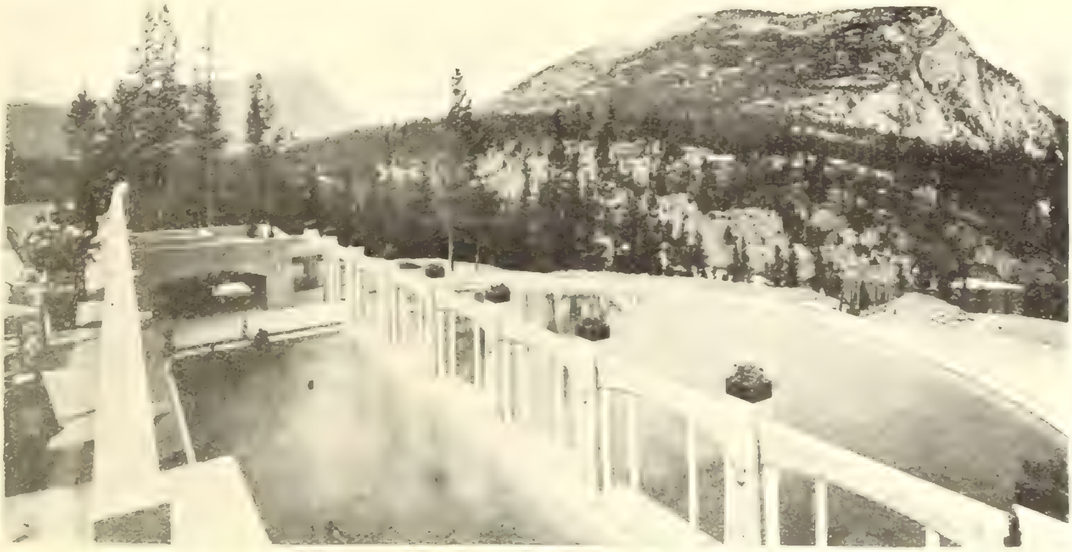
"To give contractors and surety companies a proper understanding of the obligations they assume."

"To establish contracting and suretyship on a more stable and definite basis."

"To provide for the settlement of differences by some equitably constituted authority."

Communications should be addressed to H. L. Lewman, care of Falls City Construction Company, Louisville, Ky.

The Edmonton Portland Cement Company's 1,500-barrel mill at Marlboro, Alta., has just been put in operation. The company is independent of the merger. The output for the first year has been sold to dealers in Edmonton.



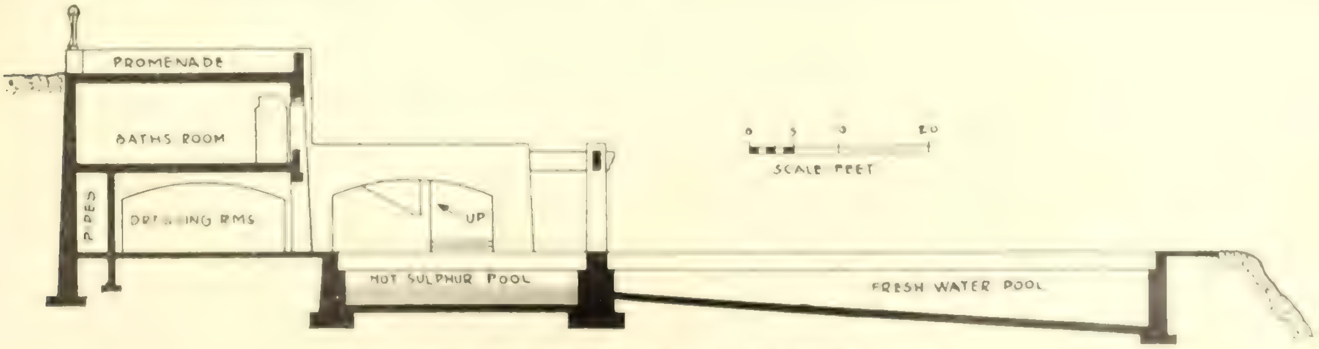
Swimming pool at C.P.R. Hotel at Banff Springs, Alberta.

Swimming Pool and Bath House at C. P. R. Banff Springs Hotel

THE Canadian Pacific Railway have operated for one season a luxurious swimming pool and baths in connection with their large hotel at Banff Springs, in the Canadian Rockies. This well-known pleasure resort overlooks the Bow River at its confluence with the Spray and the baths and pools are built on the steep hill-side above the Bow Falls, commanding the length of the valley.

The structure, which is entirely of mass and reinforced concrete, presented no particular difficulties in construction. The extreme dimensions are: length, 160 feet; width 130 feet, height 26 feet. The bath-house, shown in the figure, is built on the hill-side and the earth excavated was dumped forward on the slope to form the fill for the large semi-circular pool. Another pool, used for the hot sulphur water, lies between this outer pool and the bath-house. A promenade at the level of the lobby of the new hotel forms the roof of the bath-house. The top of the structure is at the existing ground level, so that the full height of the building was excavated, necessitating a reinforced retaining wall the full height and length of the structure. The reinforced concrete slab over the bath-house has a clear span of 24 feet and carries the thrust of the rear wall to the heavy mass construction of the front. All openings are reinforced and steel was placed throughout for temperature reinforcement.

The upper floor of the bath-house contains complete facilities for Turkish baths, with rubbing rooms, hot rooms, steam room, and drying rooms. The mechanical equipment provides for temperature changes from atmosphere to as high as 160 deg. F. in the steam room. A flight of steps at either end of the promenade leads down to the baths and to the ground level, where entrance to the pool is gained through arched openings. There are 100 dressing rooms on this level. There is a pool, 80 feet long by 26 feet wide, in front of the bath-house and enclosed on the ends by the stairways and on the outer side by a colonnade of arches heavily glazed, though the pool is exposed overhead, it being the intention to cover the pool during the winter season. The water in this pool is piped directly from the hot sulphur springs at a temperature of about 118 deg. F., reduced to about 94 deg. F. on exposure to the open air. The outer semi-circular pool, 120 feet in diameter, is filled with fresh water



Section through Swimming Pool and Bath House maintained at a temperature of about 75 deg. F. The inner pool has mass concrete walls and the outer a light reinforced concrete retaining wall. Both pools have waterproofed concrete floors and are lined with glazed brick and have terra cotta drip-gutters.

The mechanical equipment is located at one end of the structure and consists of fans and heaters for the hot air heating system and for the heating of the water. An electrically driven Buffalo Forge fan supplies air to thermostatic radiators at the rate of 100 cubic feet per second, the air passing over coils heated from the boiler room of the hotel. Two 600-gallon Tobey heaters heat the water for the pools.

The entire construction was carried out during the fall of 1911, the pool being completed for the opening of the hotel in May, 1912. The plant used was simple, the equipment being a ½-yard Ransome mixer with Ransome dump carts for conveying the concrete. River gravel was used for the concrete, of which about 1,500 yards were placed. Forty tons of square-twisted steel were used for the reinforcing. The surfaces of the concrete were all floated with a cement wash, brushed on with a piece of carpet, giving a very pleasing texture to the concrete.

The architect was Mr. W. S. Painter, Vancouver and Montreal. The entire construction was carried out by day work, Mr. E. M. Read, of Read-McDonald-Brewster, Limited, general contractors, of Edmonton, being the engineer-in-charge. The final cost was about $35,000.

Figuring Brickwork in Building Construction

THE cost of brickwork must, of course, vary considerable in different parts of the country owing to the wage scale and the cost of bricks, sand, lime and labor, says Mr. A. S. Atkinson, in the Building Age. The rather arbitrary rules figured by masons to ascertain the cost may serve as a general guide in figuring out estimates, but they are frequently far off the actual cost. The only sure way for taking up the problem intelligently is to study all the various items carefully, and then making estimates for the particular job based on this data. If one is considering a job of any size great care should be exercised in verifying these figures.

In making such estimates the cost should be made first on the materials and then on the labor, including all incidental expenses. A rule that is adopted by engineers for brickwork is to figure on 14 bricks per square foot of 9-in. wall, and 21 bricks per square foot of 13½-in. wall, making deductions for all openings. This means an allowance of 7 bricks per square foot for each half-brick thickness of wall.

If we accept this method of figuring we have 48 sq. ft. of 12½-in. wall for each thousand bricks, or practically 2 cu. yd. This is frequently taken as the standard unit of measurement. Masons, however, usually figure on 22½ bricks per square foot of 12-in. wall, which includes all openings and corners.

In former years manufacturers of bricks had a few standard sizes, and it was much simpler to apply the arbitrary rules for estimating by the thousand; but to-day the size and thickness of bricks varies considerably, and the tendency is to increase the number. The unit measurement must, therefore, show wide variation in different localities. The average size of bricks is generally placed at 8¼ to 8½ in. long, 4 in. wide and 2¼ to 2⅜ in. thick. But there are plenty of bricks both larger and smaller than this size. Some in New York are used as small as 7½ x 3½ x 2 in., and as large as 9 x 4¼ x 2½. The larger size with joints will lay up 800 to the thousand in a wall of standard measurement, and the small size 1,100 and more to the thousand-brick measurement.

Bricks vary in price as much as in size, and while $6.50 to $7 per thousand may be the average price at the yard they may in some instances cost $8 to $10 per thousand or seconds as low as $6 per thousand. The quality of the bricks must be clearly specified before any figuring can be undertaken. The cost of getting the bricks delivered varies greatly, depending upon conditions. Usually in cities where brickyards are near the manufacturers charge a uniform price for delivery. If shipped by train from the brickyards, the cost of freight, unloading and hauling must all be added to the cost of the materials. These charges may amount to several dollars per thousand in some localities. The conditions of the streets and roads makes an important factor in the situation. For instance while a team may haul 1,500 bricks as a load across good city streets, the same team could barely haul more than 500 bricks over rough dirt roads of the country. All these factors must be considered before the contractor can place an estimate to yield a profit.

The cost of mortar and scaffolding required should next be taken up. Of course, the amount of mortar used depends upon the thickness of the joints, and the joints vary a good deal in different classes of work. Taking the standard joints as a guide the amount of mortar required per thousand bricks will be as follows:

With ⅜ in. joints ... ...½ cubic yards of mortar
With ½ in. joints ... .2-3 cubic yards of mortar
With ⅝ in. joints ... .4-5 cubic yards of mortar

The amount of mortar needed being ascertained, it is next wise to proportion the ingredients so that orders can be placed accordingly. Lime mortar is used to-day only in the cheaper class of structures, and it should never be used in any heavy work, neither should it be used when exposed to great dampness. In engineering structures and in underground work all cement mortar is frequently specified and used. But for the majority of jobs sand and Portland cement in the proportion of 1 to 3, 4 or 5 are used for the mortar. To make up a cubic yard of 1 to 3 mortar there will be required .85 cu. yd. of sand and 2 bbl. of Portland cement or lime. Usually both lime and cement are used with the sand, but these vary considerable in proportion. One part lime, one part cement to six parts sand is a common specification.

One reason why one part lime is generally added with the cement is that it makes the mortar much easier to work with, and in the cost of labor this amounts to considerable. In the modern efficiency movement attention must be given to such little details. A bricklayer working with cement mortar lays

softened with one part lime. This fact has been proved by actual experience.

For a cubic yard of mortar then, with sand at 50 cents per cubic yard, lime at 50 cents per barrel, and cement at $1.75, we would have about the following cost with a proportion of 1 to 3 lime mortar:

0.85 cu. yd. sand at 50 cents	$0.43
2 bbl. lime at 50 cents	1.00
Total	$1.43

A richer and better formula of lime, cement and sand in the proportion of 1 to 1 to 2, would have the following cost:

0.85 cu. yd. sand at 50 cents	$0.43
1 bbl. lime at 50 cents	.50
1 bbl. cement at $1.75	1.75
Total	$2.68

For a strong cement mortar commonly used for engineering and underground work with a proportion of 1 to 3, we would have this:

0.85 cu. yd. sand at 50 cents	$0.43
2 bbl. cement at $1.75	3.50
Total	$3.93

The cost of sand is purely arbitrary, and cannot be fixed. It can often be obtained for the cost of carting, but it rarely costs as much as $1 per cubic yard. However, this must be considered for each locality, and prices obtained before any estimates are put in.

If 1,000 bricks of 8¼ x 4 x 2¼ in. were piled up solid without mortar they would occupy 1.65 cu. yd. of space. If the bricks cost $6.50 per thousand a cubic yard of them would then cost approximately $3.96. This comparison will enable one to see at a glance the relative cost of bricks and mortar. In the case of the cement mortar the cost of bricks would be practically the same as the mortar, but for lime, cement and sand mortar the cost for the latter would be about one-third less than the bricks, and for plain lime mortar the difference in the cost is more striking.

The Labor Cost

Having analyzed the cost of materials, so that the estimator can get clearly in mind the relative amount and cost of the various ingredients of his trade, the labor cost should next be taken up. Labor is the one item that makes bricklaying so expensive in some parts of the country. The cost of materials are fairly constant throughout the country, but labor is not. This varies as greatly as the efficiency of the men themselves. High wages do not always mean high-grade, efficient workmen.

Bricklayers are paid all the way from 50 to 75 cents and more per hour. Probably 60 cents is as near the average paid throughout the country as can be made. Hod carrier's and mason's helpers, who keep the bricklayer supplied with mortar and building scaffolds, receive from 30 to 45 cents and more per hour. These rates vary so materially that one can never figure on a job in another town or state without knowing exactly beforehand the union scale of wages prevailing there. It is never safe to assume that the same wages are paid in any two places. Many a contractor has lost heavily on contracts simply through failure to ascertain in advance the exact scale of wages prevailing in certain towns both for masons, laborers, hod carriers and carpenters. Figured on wage scale basis, one might ask how much does labor cost per thousand bricks.

The answer to this depends upon the ability and efficiency of the men and the amount of work the contractor can get from them in a day. While working on narrow piers and projections, the laying of 500 bricks by a man may be considered a good day's work, the average on a 9-in. wall may be at the rate of 1100 to 1400 in a nine-hour day. On 13-inch walls the average should run as high as 1300 to 1600 bricks, and on an 18-inch to 22-inch wall from 1500 to 2200 bricks in nine hours per man. On heavy foundations, where the work is the simplest, it is not uncommon for bricklayers to average 3000 bricks a day and even 5000 bricks have been laid by bricklayers when rushed.

On buildings equipped with an elevator and distributing arrangements, the labor of laying bricks may be as low as $1 per thousand, but on high buildings and narrow walls the labor may run all the way from $2 to $4 per thousand. The cost of scaffolding must be considered in all such contracts, for this takes labor and material. A carpenter must be employed for scaffold erection at rates ranging from 20 to 40 cents per hour. The carpenters may be withdrawn from some other part of the building to erect the scaffolds, but the charges for their time should be placed in the cost of bricklaying. It hardly pays to get masons or mason's helpers to erect the scaffolds. They do the work clumsily, and oftentimes in such a way that the scaffolds are dangerous. Besides this it takes them much longer to do the work than a skilled carpenter. Hod carriers and mortar men are better at their particular jobs, and it rarely pays to attempt to turn them to another skilled trade even in emergencies.

The cost for laying a cubic yard of bricks in a wall may then be figured out as follows:

Materials

459 bricks at $7.00 per M	$2.84
Freight on bricks	.56
½ cubic yard of sand	.11
Freight on sand	.06
0.22 bbl. of cement at $2 per bbl.	.44
1 bu. lime at 20 cents	.20
Total	$4.21

Labor for Cubic Yard of Wall

Bricklayers	$2.62
Laborers	.93
Carpenters	.39
Unloading materials	.58
Total labor	$4.52
Total materials	4.21
Labor and materials	$8.75

As 1000 bricks of the average size when piled up solid without mortar makes practically 1.65 cubic yards, and the amount of mortar used for good joints increases this pile so that the thousand bricks when laid up in a wall equals about two cubic yards, it will be seen that by doubling the above estimate for each cubic yard of wall we have the cost per thousand bricks at $17.46, which includes all materials and labor.

The work figured by the ordinary rules for a snap estimate will be a few dollars under this estimate. But a snap estimate is never intended to be more than a guide. Masons generally employ the ordinary rule and then add a dollar or two to make sure of coming out even. There are many things which interfere with the proper working out of the rules. The distance of the wall, time lost through the non-delivery of [illegible] terials, interruptions of one thing and another, and faulty work of some bricklayers which necessitates tearing down a part of the work, all tend to increase the cost. On the other hand, some contractors can stimulate their men to such efforts that they can get one-third more work out of them. This, however, is something that is very uncertain, and can hardly be placed in the calculations. Good work is essential to the success of a mason contractor, and he cannot afford to drive his men to the point that details are overlooked. Masonry must be sound, plumb in line and well set throughout to pass inspection, and a fault here and there in the walls may be sufficient to condemn the whole wall or building.

Designing of Circular Reservoirs

In designing a 300,000 gallon circular reinforced concrete reservoir for the Penetanguishene, Ont., waterworks, the engineer, Mr. L. J. Mensch, M.Am. Soc.C.E., of Chicago, adopted a somewhat unusual method of calculation, as described in a recent issue of Engineering and Contracting.

As shown by the drawings reproduced in Fig. 1, the reservoir is 50 ft. in diameter and 21 ft. deep. The side walls are of 1:1:2 concrete, 12 in. thick at the base and 8 in. thick at the top. The top is covered by a reinforced concrete dome having a rise of 5 ft., the concrete being 4 in. thick and reinforced by ⅜-in. bars spaced at intervals of 12 in. apart.

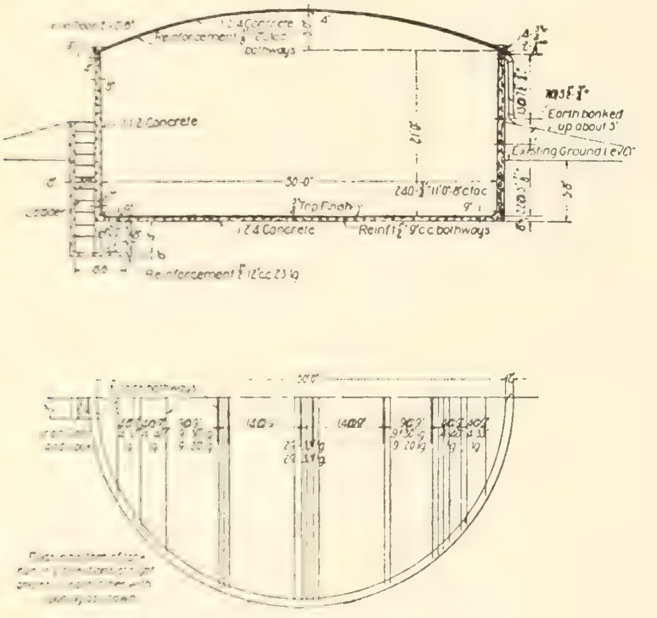


Fig. 1. Section and Half Plan.

The method adopted for calculating the reinforcement of the shell of the reservoir will be made clear by the subjoined demonstration.

If we consider the shell alone and assume that it is not connected with the bottom of the reservoir, it will be deformed under the outward pressure of water, as shown by curve A in Fig. 2. But as the shell is connected with the floor of the reservoir, it cannot elongate at the bottom, and the real deformation of the shell will be a line similar to that shown by curve 8 in Fig. 2, the deviation from the ideal line of deformation being governed by the thickness and height of the shell. The problem was first investigated by Professor Grashof, and discussed in his work on "Theory of Elasticity" in 1878. The differential equations governing the conditions are, however, of complicated nature, and even in the simplest case where the walls are of uniform thickness, the equations for the elastic curve are expressed in periodical functions and several days are required for the solution of a single problem. The equation cannot be solved for walls of various thicknesses, as the integrals of the differential equations are still unknown. However, the equations clearly show that the shape of the elastic curve is a function of h^2/rt wherein h = the height of the tank, r = the radius of the tank, and t = the thickness of the shell at the base, all the values being expressed in terms of the same unit.

In the present case, $h^2/rt = 16$, and the elastic curve only begins to deviate abruptly from the ideal line of deformation at a point 0.4h above the base, as indicated in Fig. 2. This means that the water pressure corresponding to the shaded area is not taken up by the ring action but by the cantilever action of the connection between the shell and the base.

Thus it should be clear that on the ideal beam there must be acting for this case a force above the point at 0.4h, tending to bend the beam back into the line formed by the ideal deformation of the ring sections, as the cantilever would tend to bend the top portion further out, and that the deformation at the top must necessarily be zero. The force in question is nearly a uniform load also for a height of 0.4h and equals approximately ph/24 in this case.

Now, if a beam be assumed which is acted upon by the forces as shown in Fig. 3, we can find the elastic curve from the equation

$$\frac{d^2y}{dx} = \frac{M}{EI}$$

wherein M = the moment at any section x feet from the top, E = the modulus of elasticity, and I = the moment of inertia at the section x. If the assumption of the form and position of curve B in Fig. 2 is correct, the elastic curve obtained by the foregoing general equation must be identical with curve B. This agreement can be reached after a few trials.

It is also clear that there exists in addition to the negative moment at the bottom of the shell on the inside, a positive moment higher up on the outside of the shell. The maximum value of this positive moment occurs where the shear passes through the zero value. The shear at the bottom of the shell can also be obtained from Fig. 3. This shearing stress governs the

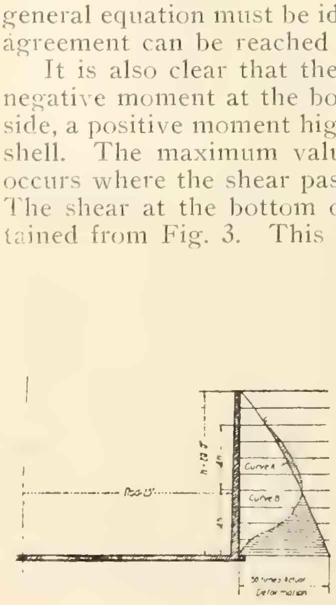


Fig. 2.

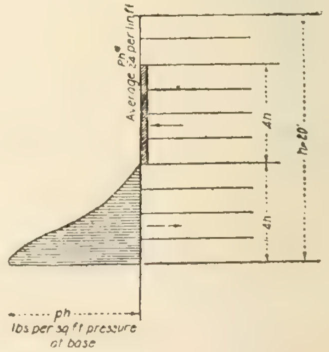


Fig. 3.

reinforcement of the bottom of the reservoir. The moment at the bottom of the shell, in this case is about

$$\frac{ph^3}{66} = \frac{62.5 \times 20^3}{66} = 7{,}600 \text{ ft.-lb. per lineal foot.}$$

The positive moment on the outside of the shell is $\frac{ph^3}{217}$ which can be taken up by the concrete without reinforcement. If the reinforcement at the bottom of the shell be omitted, the structure will first crack on the inside of the shell at the junction with the bottom, and then a large bending moment will appear on the outside of the tank.

For other values of h^2/rt the shape of the elastic curve is, of course, different from that here shown as curve B in Fig. 2, and the greater the value of h^2/rt the lower the point where the curve deviates from the ideal deformation of the ring sections.

Coloration of Fire Clay Products

CAN the quality and the refractoriness of fire clay products be judged by their coloration? In answering this question it will be advisable to discuss the different factors which may affect the coloring of the burnt clay. The iron content of the raw material is the great coloring agent of the clay, especially if its amount is high in comparison to the clay base; of further importance are the several impurities of the raw material, especially lime; the composition and temperature of the kiln gases; the density of the burnt ware.

Without regard to eventual carbon deposits caused by a strongly smoky fire, and superficial soiling produced by the ashes carried along by the kiln draft, the discoloration under the enumerated circumstances will solely be influenced by the iron content of the raw material. The higher the ferruginous admixtures compared to the clay base the darker will be the coloration.

Since the iron oxide in a finely divided condition and combined with the other components of the clay serves as a flux, raw material showing high iron contents will not be considered as fire clay. The same refers to those materials containing akalinous-terrous and alkalinous oxides, therefore clay as much as possible free of those ingredients will be used in the manufacturing of fire clay products.

As there are no clays completely free of iron, discoloration produced by the ferruginous parts will always be observed. This same discoloration will occur in the manufacture of Dinas brick by using an iron-containing quartz, but which, however, may be of sufficient refractoriness to burn to a useful brick also, only very low iron-containing material are used in the fire clay manufacture, the iron percentage, whenever, no other flux ingredients are present, and in case of respectively high clay base may reach as high as two per cent. Raw materials with different iron contents and of the same burn will show a different coloration without being necessarily different in quality. On the other hand it is possible that a brick of grayish-yellow color and another one rust-colored both of the same burn, may show a different refractoriness, and possibly in favor of the first one. According to above remarks the color of the burnt clay could not be considered in judging the quality of the ware as long as the compared brick will not be of the same burn.

The possibility of an examination of this kind is not given to the purchaser and could only be of any value to the manufacturer, this as a suggestion to a more thorough testing of the raw materials and products manufactured therefrom.

Concerning the influence of the fire gases, it has been observed that products burnt in an oxidizing atmosphere show every gradation of color from lightly pink to yellow, while products burnt in a reducing atmosphere show in general a more blackish coloration; red coloration may appear after reducing burning by the action of sulphur compounds. Other gradations of color may again occur when the atmosphere will alternately be reducing and oxidizing. The degree of temperature will also account for the gradation of color and so it seems impossible to recognize the quality of refractory ware merely from the standpoint of its color. The manufacturer alone may discover by a given tint whether one given burn differs from another one, other things remaining the same, i.e., the same composition of raw material and the same firing condition during the entire stage of burning. By taking in account the numerous gradations of color which may occur and on the other side the widely varying iron-contents of otherwise good refractory products it seems impossible to a person not acquainted with the manufacturing methods to make a true valuation, so far as color is concerned, solely based on the temperature of the burn.

Concerning the coloration as influenced by the density it will be remarked that a dense body will be darker color as a more porous body with equal iron contents. A judgment as to the value of the ware in this sense, would not be advisable at all, the coloration may be influenced by one or more of the other numerous factors.

The question, can the quality and refractoriness of fire clay products be judged by the coloration of the ware, must be answered negatively. The products of the fire clay industry cannot be judged by their color because there are innumerable factors, which are of influence in the discoloration of the ware. The technical properties are the only ones of value and they have to be established by expert tests and examinations.

Life of Street Push Brooms

In a discussion of a paper on street cleaning in down-town Chicago, presented before the Western Society of Engineers, Mr. Richard T. Fox, General Manager of the Citizens Street Cleaning Bureau, stated that he had found that the average life of a push broom when used in cleaning granite pavement was 7 days. On asphalt the life of a broom ran up as high as 12 to 15 days. On asphalt in addition to the broom, the sweepers use a scraper with which most of the work is done, so that the broom is not in use continuously. The broom generally used by the Citizens Bureau is made of two rows of African bass with a row of Bahia grass on either side. Heavier brooms, made entirely of African bass, have been used, but it was considered that these did not pick up the fine dust as well as brooms with fine fibrous material on the outside.

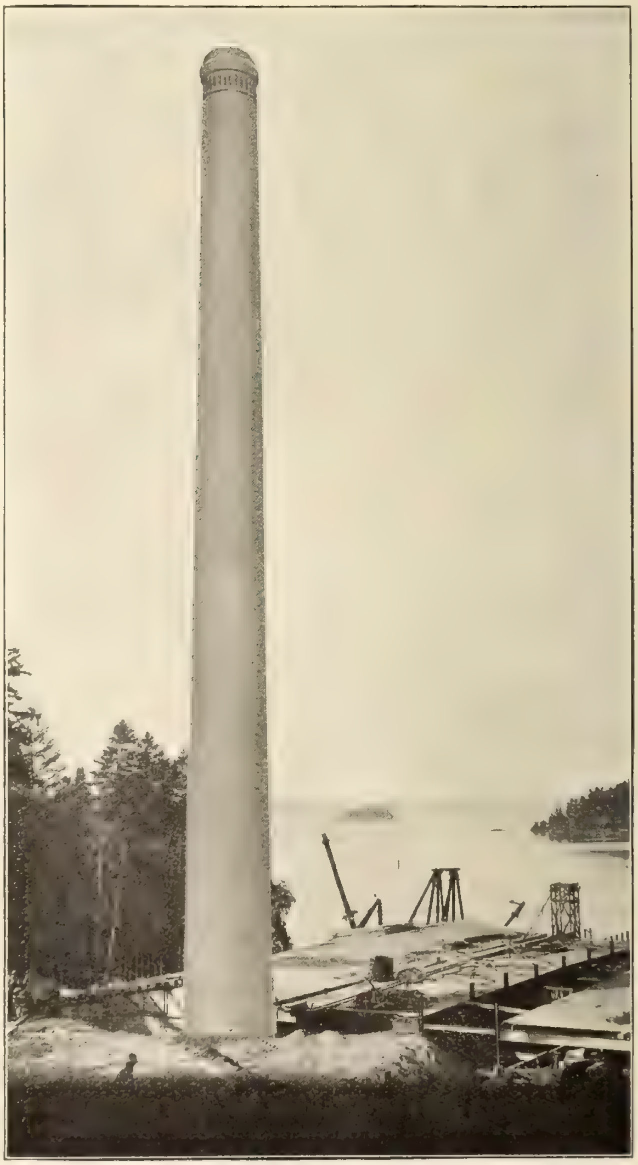
Reclaiming a swamp near Rochester, N.Y., and turning it into building lots and market gardens was recently accomplished by transporting earth from a nearby hill by hydraulic methods. The sluicing water, containing about 30 per cent. solids, was first discharged so as to form a dike separating the swamp from the adjoining lake. This dike was then enlarged until it covered the entire reclaimed area.

Reinforced Concrete Chimneys in Canada

TWO of the largest chimneys in Canada have been constructed within the past year by The Weber Chimney Company of Chicago. These chimneys are built of reinforced concrete and on what are termed "Weber Coniform Chimneys," and are so named for the reason that they are built in the form of a true frustum of a cone, being a true circle and having uniform thicknesses of wall at any given cross-section throughout. The walls and diameter decrease at a uniform ratio from the base of the chimney to the top.

One of these chimneys was erected for the Vancouver Island Power Company, at Victoria, B.C., and stands 249 ft. in heighth above base of foundation, 11 ft. inside diameter at the top, with a uniform batter which increases the base diameter to 18 ft. 7 in. The wall thickness at the base of the shaft is 15⅛ in. There is a 4 in. air-space with a 4 in. reinforced concrete lining extending to a heighth of 72 ft. above the top of the foundation. The wall thicknesses decrease in a uniform ratio, from 15⅛ in. at the base to 5 in. at the top. Between the outer wall and the lining, in the lower part of the chimney, there is a circular air-space 4 in. in width. The purpose of this is to have the lining free to expand and contract in every direction and to shield the outer wall against the direct effects of the heat and temperature variations. The outer wall takes up all the bending forces caused by the wind-pressure and prevents the sudden cooling of the lining. The base on which this chimney rests is 29 ft. square, 6 ft. thick and is reinforced horizontally with a rectangular net of ¾ in. round bars spaced 12 in. centres and with a diagonal net of ¾ in. round bars spaced 6 in. centres. This steel is placed from 4 in. to 6 in. above

Weber Coniform Chimney—erected for the Eastern Car Company, New Glasgow, N. S.



Weber Coniform Chimney—erected for the Vancouver Island Power Company, near Victoria, B. C.

the bottom of the foundation. The vertical steel, which anchors the chimney shaft to the foundation, consists of 76 ¾ in. round vertical bars, which are brought down into the foundation and anchored beneath the horizontal steel in the foundation. The vertical bars in the shaft decrease in number and size toward the top, as the bending moment produced by a 110-mile wind also decreases toward the top. The lining is reinforced vertically by 24 ½ in. round bars. The vertical bars in both the lining and the outer wall are encircled by horizontal ½ in. bars, spaced 14 in. centres; these bars take up all the shearing stresses caused by both wind and temperatures.

There is one flue connection into the chimney from the boilers, the opening into the chimney being 7 ft. 4 in. wide and 15 ft. 6 in. high. Above and below the opening the ring reinforcement is placed at 3 in. centers and the vertical bars displaced by the opening are placed in the concrete at each side, to take care of stresses occasioned by the opening.

This chimney is equipped with neither a lightning rod nor a ladder, as the vertical steel reinforcement, which is continuous, is thought by a great many engineers to act as a conductor in case the chimney is struck by lightning. There is no occasion for a ladder as the chimney is guaranteed by the builders for five (5) years, at the end of which guarantee the ladder would be unsafe and there is never any pointing up or occasion to go to the top of a reinforced concrete chimney.

The chimney erected for the Eastern Car Company, also illustrated herewith, was erected at New Glasgow, N.S., in the late Fall of 1912, and is 202 ft. 6 in. total heighth, 9 ft. 6 in. inside diameter at the top, with uniform batter which increases to an outside diameter of 15 ft. 10 in. at the base of shaft. The foundation for this chimney is 22 ft. square, 4 ft. 6 in. thick and is placed 24 ft. 6 in. below grade. Horizontal reinforcement in the foundation consists of a rectangular net of ¾ in. round bars at 24 in. centers and a diagonal net of ¾ in, round bars at 12 in. centers. The first section of the chimney anchoring the shaft to the foundation contains 64 ¾ in. round vertical bars, this number decreasing to 12 ½ in. round vertical bars in the upper 35 ft. of the chimney. The lining, which is of reinforced concrete with a 4 in. air-space between the inner and outer wall, starts at grade line and extends for a distance of 47 ft. 6 in. above grade. The smoke opening enters the chimney at approximately 10 ft. above grade line. The lower 20 ft. of the chimney is back-filled with earth and at the grade line is a 4 in. reinforced concrete floor. The cleanout door for removal of soot is located at grade. Horizontal ring reinforcement is spaced 14 in. on centers, encircling the vertical steel, the same as is the general practice in this type of construction.

This chimney is equipped with a lightning rod consisting of two runs, or down cables, 17-32 in. in diameter, properly grounded in permanent moisture at the base of the chimney. These two cables are located on opposite sides of the chimney and are connected at the top by copper circuit encircling the head of the chimney, from which extends four platinum tipped points, 4 ft. above the chimney.

The concrete in each of these chimneys was mixed by machine and was a wet mixture which allowed thorough tamping into the forms and around the steel bars, in order to secure dense composition and the best possible bonding of the materials. The concrete for the foundation is a mixture of one part Portland Cement, three parts of clean sharp sand and five parts of crushed stone (stone not greater than 2 in. in size). Concrete for the shaft was a wet mixture of one part Portland cement, 2½ parts of sand and four parts of gravel (not more than 1 in. in size). All Portland cement used was of the best quality and purchased subject to the specifications and requirements of the American Society of Testing Materials.

All vertical steel joints are staggered and bars overlapped at least 24 in. The horizontal rings were bent to the required circle and overlapped 14 in., the ends being slightly bent.

In designing a high factor of safety was allowed and low stresses calculated on both steel and concrete, resulting in a very conservative design. Calculations used in designing are based on formula of Turneaure & Maurer; M. E. Turneaure, Dean of College of Engineering, University of Wisconsin, and E. R. Maurer, Professor of Mechanics, University of Wisconsin, as published in "Principles of Reinforced Concrete Construction," second edition, page 398. The resistance of concrete itself against tension is not taken into consideration in the calculations. The Weber Chimney Company's Unit Forms, consisting of a series of wooden units, were used throughout the construction of the work. These are held together in a rigid manner in the form of a true circle, at the same time retaining the principle of flexibility so that the necessary units may be removed from the form at regular intervals so as to properly reduce the diameter of the chimney and the thicknesses of the walls in a uniform ratio.

There are now twelve Weber reinforced concrete chimneys under construction in the Dominion of Canada, varying from 100 ft. to 200 ft. in heighth and are located from West St. John, N.B., in the east to Prince Rupert, B.C., in the west. Some of the oldest concrete chimneys are located in Canada and have proven, beyond doubt, the suitability of reinforced concrete for chimney construction. While the cost of a reinforced chimney is greater than that of a steel stack, yet it is of course permanent and costs less than a brick chimney.

New Plant of Nova Scotia Clay Works, Limited

THE Nova Scotia Clay Works is now building another plant at Elmsdale, N.S., which will be one of the most up-to-date plants in the province. The buildings will be all brick with structural steel, and entirely fireproof. The quality of the clay at Elmsdale is without doubt the finest clay in Canada, and the product as manufactured by this company has gained a reputation which is second to none. This plant will be equipped with the best and most up-to-date machinery known to the clay industry, and in connection with their plant they will have a top coal fired continuous kiln of 50,000 daily capacity. This is the third up-to-date plant that the Nova Scotia Clay Company has built, and in each case the entire equipment was furnished by the American Clay Machinery Company, of Bucyrus, O. They are firm believers in the coal fire continuous kiln, and have thoroughly investigated the kiln question and through their own experience have been convinced that this type of kiln is the simplest and most economical kiln, both in operation and construction, and claim it is impossible to get any better results, as they have averaged ninety-five per cent. No. 1 brick with this type of kiln.

The Elmsdale plant will have a capacity of [illegible] brick per day. The clay will be taken from the bank with a steam shovel and loaded into steel side dump clay cars. These cars will be drawn up an incline by a friction hoist to a point opposite the three wet grinding and mixing pans, where the clay will be thoroughly mixed and prepared. After being prepared the clay passes over conveyors and is discharged into double shaft pugging and mixing mill. This mill is all mounted on a structural steel frame which sets directly over the No. 65 "Auger" brick machine. After the clay leaves the die it passes on to the automatic cutter and out on to the off-bearing belt, where the brick are taken off and placed on steel dryer cars. They are then taken into the sixteen tunnel steam dryer. This dryer is fireproof and thoroughly up-to-date. In addition to the brickmaking unit there will be a separate and independent unit for making tile and hollow ware, and there will also be a sewer pipe press installed to take care of the big demand for sewer pipe. Work has started at Elmsdale and the plant is now under construction and will be rushed to completion as quickly as possible.

A New System of Ventilation

THE importance of ventilation is so fully recognized, and the methods generally adopted for attaining this end are so well known, that neither subject need be discussed in the present article, which is devoted to a new system devised by Mr. Achille Knapen, M. Soc. Ing. Civ. (France), and termed by him "Differential Aeration."

It may be remarked that the term "ventilation" does not quite happily denote the action of the system in question, which, so far as theory is concerned, differs from systems of ventilation hitherto adopted in the respect that it does not provide merely for the periodical renewal of the air in the apartment or building, but aims at the continuous introduction, without perceptible movement, of a quantity of fresh air equal to the quantity of air exhausted by the occupants, while definitely eliminating the condition of confined air whether the apartment or building is occupied or not.

From the practical standpoint the distinctive characteristic of differential ventilation is that, instead of being based upon vertical air movements alone, it combines the elements of horizontal ventilation, depending for its motive power and originating movement upon the constant difference of the densities of the air inside and outside the space to be ventilated.

Instead of providing only for the extraction of light gases from above or of heavy gases from below, the new system establishes a constant lack of equilibrium in the mass of air enclosed by an arrangement of three series of inlets and outlets, of different dimensions, placed at different levels and in different walls, facilitating the extraction of light and heavy gases and at the same time the entrance of fresh air, either at the top, bottom, or middle, or at all three levels simultaneously.

The arrangement is one for which the inventor claims the effect of placing in constant relation, throughout the atmospheric stratification of any story, all the air of the apartments enclosed by the exterior walls of the building.

In buildings where large volumes of air have to be dealt with the employment of mechanical ventilation may be necessary in order to ensure adequate results, but in small buildings the renewal of the atmosphere can be effected by utilising natural laws, the operation of which in differential ventilation is made clear in the following statement of the principles constituting the basis of the system.

It is assumed (1) that each room, when the doors and windows are closed, should be continually in communication with the outer air and with the interior air of the building by means of openings capable of regulation, and arranged to obviate perceptible draught; and (2) that the air inlet and outlet openings should be of dimensions exactly calculated in every case, and should be placed at different levels and in different sides of the room. In a building provided with such means of communication the air of all the rooms and other interior spaces on each storey is in permanent contact at various levels, and is also in communication with the outer air, even with all doors and windows closed.

Consequently the air in every room or other interior space will be set in motion by every difference of density caused by interior or exterior variations of temperature. These differences result in the circulation of all the air between the walls pierced by openings, and in the entry of fresh air, and the exit of vitiated air in quantities proportional to the differences of atmospheric density.

The form of the wall openings adopted in the differential system is such that the difference of level between the inner and the outer end permits the circulation of air in opposite directions in the same conduit, and to a certain extent establishes automatic regulation of the air entering and leaving the building, according to the differences existing between the tension and the pressure obtaining in the two places, and due to the cold or heat, humidity or dryness, and the density of the fresh and vitiate air.

If these differences are very great, the movement of air may be excessive, and therefore the openings are fitted with shutters by means of which the circulation can be regulated in case of need.

It should be noted that the arrangement is one causing horizontal movements of the air between the opposite sides of each room, thus establishing ventilation similar to that secured by the use of open windows along two opposite walls. At the same time, however, the vertical movements mainly relied upon in ordinary methods are also utilised in the new system.

The inlets and outlets are arranged as follows:—Ducts with apparatus for regulation of the openings are placed below the ceiling and as far as possible near the corners of the room to be ventilated. Other ducts are situated under the window-sills or along the sides of the window-frames, and registers are placed at the top or bottom of doors or in the skirting.

Openings intended for aeration through an outer wall are arranged with a certain amount of inclination, which not only gives the required direction to the currents of air, but also prevents the penetration of rain into the building.

The ducts employed near ceiling level are generally from 15 to 30 centimeters in diameter, and those under window-ledges from 10 to 20 centimeters in diameter, being proportioned with due regard to the dimensions of the ducts above.

In connection with the system there are three general cases depending upon the relative values of the tension (T) and the pressure (P) of the air inside and outside the building. Where T equals P no movement takes place; where T is less than P the movement of air is into the building; and where T is greater than P the movement is from the building into the outer air.

The registers used in doors or on skirtings are made with three, four, or five openings, 10 millimeters wide by 30 millimeters high, separated by a distance of 10 millimetres, and provided with fine wire gauze to keep insects out. The corresponding plate for the opposite end of the duct has double the number of openings of the same height, but only 5 millimetres wide, also fitted with a screen of wire gauze.

If found necessary, the transmission of sound from one room to another can be minimized by interposing a pad of fibrous material, such as slag wool, between the two parts of the register.

It is desirable that the registers and the regulating grids for the inner end of ducts through exterior walls should be constructed of aluminium, or, better still, of compressed paper or wood pulp, so as to obviate the condensation of moisture.

Applications of the Knapen differential system of ventilation to schools, churches, public buildings, dwelling-houses, and stables have demonstrated its practicability and effiicency, among such buildings being the Musee de Louvre, Paris; the Church of Notre-Dame de Pamele, Belgium; the Palais Royal Brussels; the Royal Chalet, Ostend; and the Chateau d'Everberg, Belgium.

What is an Engineer?

OF the four leading professions practised in the civilized world, namely—Ministry, Law, Medicine and Engineering, the latter has the least standing today, although the nobility of its calling ranks favorably with that of any of the other professions, says Mr. E. N. Percy, in a recent issue of The Architect and Engineer. This lack of respected eminence is due to several causes, having their origin in the ancient custom of despising the man who works with his hands. The immediate and most important reason existing at the present time is the fact that while a member of the clergy must prove himself worthy and obtain certain licenses and diplomas, a member of the legal profession must establish himself before the bar and a Doctor of Medicine must be licensed by his government before they can practice their respective professions, an engineer is free to represent himself as such to the public regardless of his training. The training of the three great professions just mentioned must be both academic and practical before they are permitted to practice.

The word "Engineer" is generally used today as a misnomer, conveying no information whatever. Jones & Smith, who a few years ago were respectable and prosperous tinsmiths, have blossomed out as ventilating engineers without any known addition to their previous engineering knowledge acquired in the tin shop. Mr. X., who for many years conducted a reliable draughtsman and blue print business, has announced himself as a civil engineer, despite the fact that the extent of his out-door experience has been an annual vacation of two weeks. Frank Brown, who was chief engineer of the Cosmopolitan Life Insurance Building for the last fifteen years, has taken up consulting engineering notwithstanding that he has never designed an engine and could not do so if he wished, and has never built one. Professor Z., of the Baptist College of Engineering, who elucidates equations for the benefit of embryo engineers, has opened consulting engineering offices in spite of the fact that he could not tell a file from a drill, and had never had a pair of calipers in his hands.

The truth of the matter is, in the writer's opinion, that a true engineer, whether civil, mechanical, electrical or of some other branch of industry, is a man trained practically and academically in all the branches of his specialty, and thoroughly qualified thereby to perceive the particular type of design required for his problem, to make that design, to personally supervise the construction in accordance with that design, instructing less expert workmen how to perform their tasks with the tools necessary, to assemble the elements of this design into an entirety and finally with his own hands or under his experienced supervision place the entirety in operation and operate the same to the satisfaction of all concerned.

If a man is able to perform one branch only of these various phases of engineering he is not an engineer, but a specialist of limited capacity, of limited opportunity or limited experience, it being conceded that it takes an exceptional man to make a good engineer just as it takes an exceptional man to make a good minister, lawyer or doctor. He must have the character and perseverance to properly serve his time practically and academically at his profession. He must have the memory, reasoning power and initative necessary to the great work of creation, execution and operation incidental to engineering problems.

If a man is skilled in shop work only he is not an engineer but a mechanic, artisan or fitter and may well be proud of his calling provided he can do his work well.

If a man is skilled in draughtsmanship he is not an engineer, but a draughtsman. A draughtsman should have a technical education, but this by no means makes him an engineer since his judgment is comparatively worthless ouside of the realm of equations, curves and academic data. For instance, in the design of concrete, education plays a comparatively small part, the designer being absolutely dependent upon his judgment which in turn is the fruit of actual experience with these materials and can be derived in no other reliable manner. Therefore, the academic draughtsman, no matter what his education, is not a reliable designer. On the other hand, neither can the draughtsman who has served his time in the shop and the foundry or the steel works, but is practically without technical education, be a reliable designer for the reason that a great deal of work, such as the proportioning of fitted parts, design of structural steel, prospective pressures, stresses, etc., can only be arrived at through the medium of technical work. Such a man is not a reliable designer excepting under circumstances in which his work will be confined to detailing or copying the designs of others with such minor alterations as lie within the scope of his personal experience.

The proper training of an engineer is a problem which each man should solve for himself and in do-

[illegible] so should seek the advice of disinterested parties for the reason that experience and education in the various branches of his chosen profession are acquired from institutions which have in every case a view point of their own. A university with its renowned teachers, its laboratories, its super-scientific methods of approaching all problems, its horror of empirical methods, while offering what is probably the best possible mental discipline that a young man can have, holds the future engineer's ideas along channels that are a little narrow when in the commercial world. To illustrate this point—it is the experience of practically every technical student to learn the last possible word in the design of machinery or structures for economy of operation. His first experience in the industrial world is to learn that in the vast majority of cases economy of operation is a minor consideration and initial investment a very big consideration. Furthermore, he learns that the power plant, to which he has devoted so many years of study, is a minor part of, for instance, a shoe factory, and the shoe machine, about which he never learned anything, he is asked to improve and simplify, in order to increase production.

It is not the purpose of this article to criticise any institution and last of all our sources of learning, but merely to make certain statements in the endeavor to define an engineer. The only way to obtain practical experience is to apprentice one's self in a shop or on a pile driver or in an electrical plant or with a gang of laborers according to the branch of the profession in which a man may engage. With the apprentice system it is an unfortunate fact that the seeker for information and experience must suffer from economic conditions, that is to say, employers use apprentices not for the purpose of educating them for the shop, but as a means to obtain cheap labor, and in most shops an apprentice will be paid as little as it is possible to obtain an apprentice for, and they are usually kept on one task as long as possible with a view to increasing their production. Their experience on one task is entirely out of proportion to the time necessary for obtaining a knowledge of the same. This is particularly so with young men whose minds have been thoroughly trained and who tend to grasp the details of practical experience more quickly than the untrained apprentices. It is a well known fact that a bright apprentice with from one year to two years' experience can leave and get a position at another shop for three or four dollars a day and thereby prove that he is worth that amount of money to his original employer. It is also a well-known fact that the shop which trains an apprentice will never pay him as much upon the completion of his apprenticeship as will another shop. At the same time they will take in an outside apprentice for more money. This is based purely and simply upon the idea that "a prophet hath no honor in his own country."

Therefore, cannot the various engineering societies determine upon a standard which shall define the engineer as a man who is trained in all branches of his profession, requiring that other members of the engineering society shall be known in accordance with their training as technical experts, artisans or fitters, operators, constructors, and honored as such in their respective branches, and to be known by two or three names as they progress from one department to another; that is to say, draughtsman and machinist, mechanician and operator, tinsmith and ventilating mechanic. Reserve the honored term of engineer for those who are engineers and can, as stated above, conceive a design suited to a condition, make that design, build the structure to that design and place it in operation. Can not engineers work together to have this status recognized and legalized by the federal government with proper penalties for misuse of the term, making the engineer a man who is respected by every member in every branch of his profession because he is equally skillful with any of them.

It is a common expression in this day and age to hear that young engineers are a "drug on the market," and it is the truth with this qualification; they are not engineers. The shops are graduating men every day who call themselves engineers, when they are in reality machinists, unable to operate a large power plant. One of the finest training schools in the world, namely the Merchant Marine, is yearly licensing through the federal government competent young men as engineers, who are perfectly qualified to operate large power plants and in most cases are able to build them because of the necessary previous training in a shop, but are utterly incapable of designing same, forecasting results or even of analyzing sources of loss in engines. Such men are to be honored in their profession as skilled and licensed operators, but it is not proper to call them engineers any more than we would call a nurse or a skilled hospital attendant a doctor.

As engineering is practised to-day in its higher branches, a brilliant academic man will as a rule cooperate with a brilliant practical man to bring about a desired result, neither one of whom could go ahead alone; but it frequently happens that one is acting for the buyer and the other for the seller, and it is only human that personal jealousies shall arise between men so differently trained, neither of whom is willing to concede, as a rule, that he lacks the particular training which has been the lot of his colleague, and it would be much better if one man had the complete training.

New Drainage Projects in Egypt

IN the note on this subject which appeared in these columns on February 14th, Sir William Willcocks' alternative proposals were very briefly mentioned and some injustice was done to his views. In the first place, it was not accurate to say that he regretted the passing of the basin system of irrigation. He has an intense admiration for the wisdom of the Egyptian king Menes, who 7000 years ago made the first "hods" or areas enclosed by dykes, into which the flood water of the Nile was turned to deposit its rich sediment. That system, as Sir William says in "The Nile in 1904," is "the most efficacious method of utilising existing means of irrigation which the world has witnessed," given the conditions of Egyptian climate and time of Nile flood, but he recognises that the demand for summer crops—especially, of course, cotton—has relegated basin irrigation to the reclamation of waste lands and the building up of poor soil. It was for such purposes that he advocated its retention in his recent lecture. The second point was with regard to the zone system of drainage which was attributed to M. V. Mosseri. In the second edition of "Egyptian Irrigation," which appeared in 1897, Sir William advocated drainage by "zones" or areas, each with its own separate system of secondary drains and pumps. M. Mosseri is sponsor for a zone system somewhat different from Sir William's, but the reference in the lecture was to a system of secondary drainage, applicable to zones, which has been most successfully introduced by M. Mosseri on his own estates in Lower Egypt. This system, said the lecturer, "has been recommended for adoption in France by the authorities appointed to examine the question of the reclamation of the swamped lands, bordering on the Mediterranean." By its use, the quantity of water to be pumped is reduced to a minimum.

Another point to be made clear is the area affected by the new drainage works now taken in hand. The total is about a million acres or about a quarter of the arable land of the Delta. It is in two tracts of about equal size, one stretching south-east from Lake Mariout at the extreme west of the Delta and the other running south from Lake Borollos in the centre of the Delta. The intention is to treat the whole of Lower Egypt, with the possible exception of the tract at the extreme south or apex of the Delta, in the same way and the whole scheme is likely to cost about $10,000,000.—The Engineer.

The Use of Oil in Concrete and Mortar

CONCRETE or mortar mixed with a small percentage of oil is almost entirely waterproof, and is therefore very suitable for use in structures exposed to, or intended to exclude, moisture. In most cases, the impermeability of concrete or mortar can be secured by the addition of a weight of oil not greater than 5 per cent. of the weight of dry cement used. An extensive series of tests recently undertaken by the U.S. Bureau of Public Works shows that the admixture of such a proportion of oil involves no appreciable loss in tensile strength; a slight loss in compressive strength is caused, but this does not become serious until the amount of oil rises to 10 per cent. of the weight of dry cement.

Oiled concrete adheres but weakly to iron and hence cannot be satisfactorily reinforced by smooth bars. Where expanded metal, latticework, or profile bars are used, the reinforced structures are as reliable as those in which the concrete contains no oil; the best results have been obtained by using an ordinary petroleum oil conforming to the following specification: Sp. gr. 0.93—0.94 at 25° C.; at least 99 per cent. solubility in CS_2 at ordinary temperatures; not less than 1.5 per cent. or more than 2.5 per cent. of bitumen insoluble in paraffin of 86° B.; residue after combustion not less than 2.5 per cent. or more than 4.0 per cent. If 240 cc. of the oil are maintained at 50° C. for at least 3 mins. in an Engler viscometer, the first 100 cc. of oil should be from 40 ° to 50° viscosity, and if 20 grms. of the oil be heated for 5 hours at 163° C. in a metal capsule 60 mm. diam. × 25 mm. deep, the loss of weight must not exceed 2 per cent.

In preparing oiled concrete, sand and cement are first mixed dry and water is then added to form a mortar. The determined amount of oil is then mixed in until no trace of it is visible on the surface of the mixture. Finally, the requisite amount of wet stone or gravel is added, and the whole is again mixed until homogeneous. Mortar is mixed in a similar manner except that no stone or gravel aggregate is required. If a mechanical mixer be used, the cement and sand are first mixed with water, and oil is then gradually added, with the intermediate addition of two or three shovelfuls of gravel at a time; finally the remainder of the gravel is added.

Concrete or mortar thus made is recommended as being very suitable for use in dwelling houses, shops, warehouses, stables, etc.—in fact wherever it is desired to withstand or exclude moisture.—Engineering Review.

Cement-Making Material

A barrel of Portland cement will consume about 450 pounds of limestone and 150 pounds of clay or shale. A plant making 1,000 barrels a day will therefore use, in the course of an ordinary year, about 66,000 tons of limestone and 22,000 tons of clay or shale. Assuming average density for these materials, a 1,000-barrel plant will use up almost 1,000,000 cubic feet of limestone a year, together with 250,000 cubic feet of shale.

As the investment in plant is heavy, it would be folly to locate a cement plant, under ordinary circumstances, at a point where less than twenty years' supply of raw materials is in sight.

A 216,000 h.p. Hydro-electric development is in course of construction at Nore Falls in Numedal, Norway. This station will be one of the largest in the world and the largest in Europe. It is being built by the Norwegian Government, and it is intended to deliver the generated current partly to the capital, Christiania, and partly to the southern provinces of Norway. The power house, which will be 525 ft. in length, is located at the foot of a mountain on whose side the forebay is located. This forebay is through a 37-mile tunnel connected with the reservoir, located on the opposite side of the mountain in the Nume Valley. It has been calculated that a net head of not less tha 1,378 ft. will be available. The hydraulic equipment will consist of eleven 20,000 h.p. and two 10,000 h.p. Pelton wheels. The total number of horse power for sale will be 216,000.

Roof tile experiments to aid in determining the most generally satisfactory covering for buildings along the Catskill aqueduct have been made by the Board of Water Supply of the City of New York. Terra cotta, granite, slate and reinforced concrete were among the materials investigated. After careful comparison, according to the board's annual report for 1911, it was decided that reinforced concrete best satisfied the requirements of economy, appearance and durability. A tile roof of this material was found to be exceptionally light and strong. These tiles are easily placed, as they rest directly upon purlins; and in gate houses or similar buildings their under sides serve as ceilings. Several full-size tiles were made and tested in the laboratory.

A novel idea propounded in the sixth preliminary report of the New York Metropolitan Sewerage Commission is to build an artificial island three miles out at sea for treating a portion of the New York sewage in settling tanks. The site for the proposed island is a sandy reef near Coney Island, and the sewage will be delivered by a 14 ft. diameter tunnel. The shore of the island will be a bank of riprap deposited from boats, and the interior will be formed of sand dredged from the sea. The island will be 1,300 ft. long by 1,000 ft. wide, and its surface about 18 ft. above low-water level. At the landward side it is proposed to construct a small harbour for the accommodation of vessels bringing supplies. The cost of construction is estimated at about [illegible]

Permanent Track Construction

By Mr. C. B. Vorce,* Mem. A. S. C. E.

The B. C. Electric Railway Company, Limited, is a public service corporation operating the electric railway lines in Vancouver and adjacent municipalities on the mainland, together with the electric railway lines in Victoria, situated on Vancouver Island. The total length of railway operated is 303.54 miles, of which 148.77 miles are city lines and 154.77 miles are interurban lines. Of the city lines, 43.43 miles are double track and 61.91 miles are single track. 77.13 miles are of permanent construction on paved streets and 71.64 miles are standard steam railway construction on unpaved streets. The country in and around Vancouver is a rolling country and the maximum grade is 8.75 per cent. while in and around Victoria is flat giving no grade of more than 3 per cent. The population served by the railway on the mainland is about 200,000, while the railway in Victoria serves about 75,000 people. During 1912, 50,000,000 passengers were carried on the mainland and 12,000,000 in Victoria.

T rails are used exclusively on paved streets, 7 inch rails weighing 91 lbs., 87 lbs. and 70 lbs., depending on the amount of traffic. On unpaved streets and on the interurban lines the municipalities permanently pave the streets. The cost of this paving from curb to curb, together with concrete foundation is borne by city or municipality. Before the writer became connected with this railway company the permanent track work was let by contract to the contractor for the city paving. This method gave such poor results that the writer organized a construction department to enable the company to do the work themselves. The plant used in doing this work is as follows:—

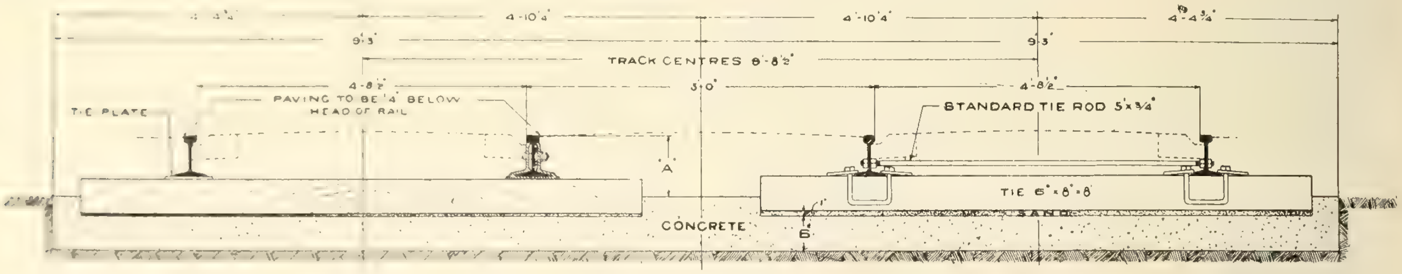
One Model 40 Marion steam shovel.
One Model 20 Marion steam shovel.
One A1 Thew automatic steam shovel.
One A1 Thew automatic electric shovel.
One steam derrick with 60-foot boom.
One Brown hoist derrick car.

Two Koehring concrete mixers with 27 ft. delivery boom operated by gasoline.

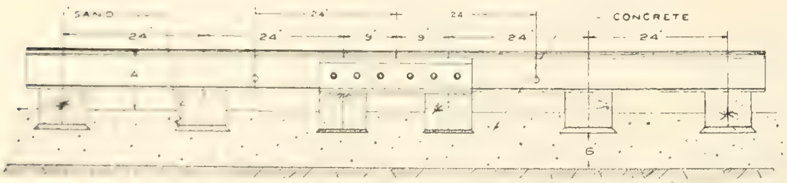
Two Koehring concrete mixers with 30 ft. delivery boom operated by gasoline.

One Koehring concrete mixer with 30 ft. boom operated by steam.

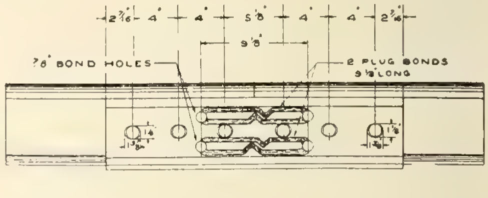
One 3-ton Packard motor truck.



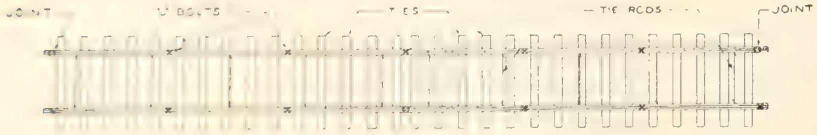
CROSS SECTION



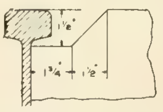
LONGITUDINAL SECTION



DETAIL OF DRILLING AND BONDING



PLAN



DETAIL OF FLANGEWAY

Fig. 1.—B. C. E. R. track construction.

where the standard steam road construction is used, the rails are either 70 lbs. or 60 lbs. A. S. C. E. section.

Previous to the writer's connection with the company the concrete girder type of construction was used on all permanent track work on paved streets, but owing to the breaking of the girder, due to the poor character of the foundation, the writer recommended and secured the adoption of the slab type of construction, Fig. 1, which gives a solid foundation on which to lay the track. The sand cushion was introduced between the concrete foundation and the tie to give the track as much resilience as possible, as the writer believes that the rigid type of construction resulting from the rail laid on steel ties embedded in concrete materially increases the cost of car maintenance.

Under our various franchises the company is compelled to replace the open or steam railway type of construction with a permanent form of construction whenever the city or

Five Duntley track drills.
Two Duntley track grinders.
Two rail planers.
Six centre dump wood ballast cars, 20 yds.
Four side dump wood ballast cars, 20 yds.
Five Koppel steel side dump cars, 15 yds.

Shunters are assigned to the construction department by the transportation department as required for construction work.

The method of construction is as follows:—Whenever the company is notified that the city or municipalities are ready to commence paving operations the railway company, whenever the width of the street will permit, build a temporary track on the side of the street with sufficient passing sidings to take care of the traffic. This leaves the centre of the street free and allows the building of the permanent double track without interruption. It might be added here that all paved streets are double tracked.

Grading operations are then started, the material being hauled by teams to a dumping place fixed by the city. In previous years all the material has been excavated by hand but during the coming season a steam shovel specially designed for shallow cutting in the track allowance will be used. It is hoped that this will materially reduce the cost of excavation, as common labor is paid from 25c to 37½c per hour. When the rough grading has been completed forms are set on each side of the track allowance, 18 ft. 6 in. wide, the top of the forms being the top of the concrete slab, and a gang of fine graders trim up the excavation to a grade 6 in. below the top of the forms. The concrete slab is then started. The gravel, sand and cement are delivered along side the track allowance, thus minimizing the distance travelled by the wheelbarrows, and the aggregate is delivered in place by a bucket travelling on the mixer booms. In this way labor, which is the most expensive item we have here, is reduced to a minimum.

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* Construction Engineeer B. C., Electric Railway Company, Vancouver, B. C.

After the slab has set for one day, the rails are laid on ties placed 2 feet centre to centre except at the joints where the spacing of the ties is governed by the length of the joint. The ties are then shimmed up to grade by placing small pieces of factory wood clippings at each end. A concrete mixer, Fig. 2, running on flanged wheels is then placed upon the track and the second operation, which brings the concrete up to the under side of the city's pavement foundation is commenced.

The remainder of the work in the track allowance, viz., paving together with the foundation for same, is paid for by the city or municipality.

So much delay and confusion has arisen on account of the railway company being unable to commence its work until the paving contractor had excavated to the city's subgrade in the track allowance, that the writer entered into an arrangement with the city authorities so that whenever possible the railway company enters into a contract with the city to do the grading and concreting in the track allowance at the same price as the city pays the paving contractor—this arrangement has so far worked very satisfactorily.

During the past few years the railway company has done a considerable amount of track reconstruction. In some cases we have been able to divert the traffic to other routes, which has enabled us to reconstruct both tracks at the same time. In other places however we have built a temporary track and rebuilt one of the permanent tracks at a time as it was necessary to have a double track to handle the traffic.

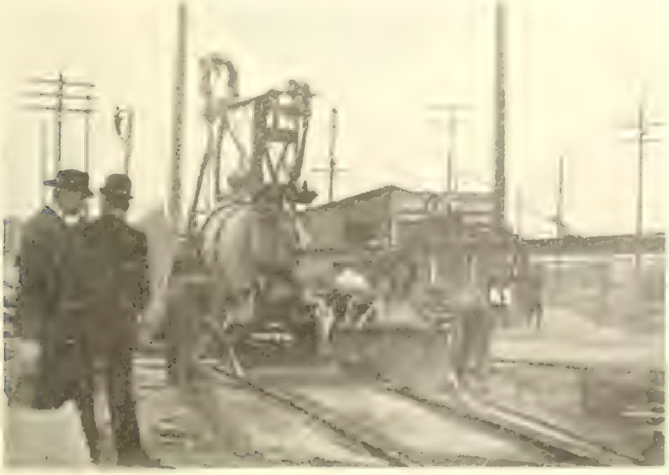


Fig. 2.—Concrete mixer on flanged wheels

In this reconstruction work the principal difficulty encountered has been the removal of the concrete. Labor is so high that the manual method in use before the writer became connected with the company could not be used economically. Some mechanical method had to be adopted and the writer designed the "so-called" concrete breaker shown in Fig. 3. The dipper was taken off our electric shovel and pile driver leads were hung from the boom. In these leads ran a 2,600 lb. hammer with a wedge shaped base. The concrete was broken by dropping the hammer. The smaller pieces were loaded into skips which were dumped into wagons, and the larger pieces were handled by a steam derrick and loaded on to flat cars. This method was about one-half as costly as the old hand method.

This year we purchased an A1 Thew automatic shovel specially designed to dig in the track allowance, and in a piece of track reconstruction just finished we have not used the concrete breaker but have taken out the concrete with the shovel, Fig. 4. This has further reduced the cost of removing the concrete so that the cost per yard for removal is only about 65 per cent. of what it was last year.

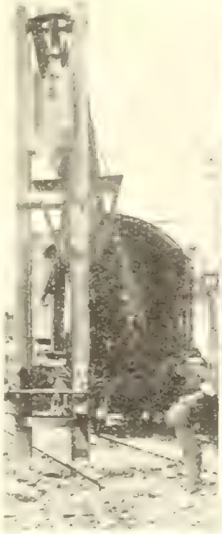


Fig. 3.—Concrete breaker.

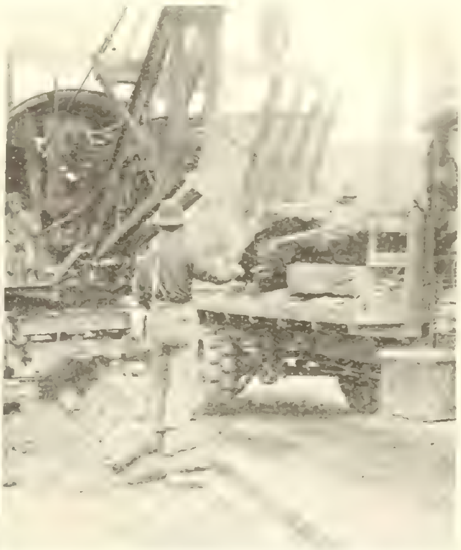


Fig. 4.—Shovel loading concrete on motor truck.

At intersections solid manganese tongues, switches, mates and frogs are used in the special work and when the traffic is particularly heavy the curved rails are also of solid manganese.

The special work is installed without interrupting the traffic, the greater part of the work being done at night after traffic has stopped. The track allowance is first excavated to a point from 20 in. to 22 in. below the top of rail and new ties are put in on blocks so that when the special work is laid on them it will be to the established grade. As many pieces of the special work as it is possible to handle are bolted together and put in place with the derrick car. The intersection is then concreted, the concrete being brought up to within about one and one-half inches of the base of the rail in one operation. Short blocks, 20 in. long, 6 in. wide, and 4 in. deep, are then embedded in the concrete between each of the ties and the concrete is then allowed to set for ten days. Wedges are then inserted on top of these blocks and the special work brought to a firm bearing. The spikes are then drawn from the ties which are pounded down, thus taking up any settlement which may have occurred. Steel shims are inserted between the tie and base of rail and the concrete brought up to the base of rail. This method has proved very satisfactory and we have had no trouble with the special work, some of which has at least 3,000 cars per day passing over it.

Although common labor is paid from 25c to 37½c per hour and our cement costs us [illegible] per bbl. [illegible]

[illegible] with one of the largest [illegible] (2), and one of the largest cities [illegible] (3), are as follows:

	1	2	3
Removing pavement	37%	58%	100%
Earth excavation	[illegible]	68%	100%
Concrete excavation ...	37%		100%
[illegible] ...	60%	100%	.....
[illegible]	73%	.	100%
Concrete per yd.	68%		100%

The writer has been ably assisted in his work by H. J. Tippet, engineer maintenance of way, and by A. J. Kennedy, [illegible]

Reasons For and Against a Cash Deposit from Contractors With Tenders

For a Cash Deposit

1. You want security that contractor will sign contract if tender awarded him.

2. You believe that five per cent. of the amount of his tender is sufficient to show his bona fides and compel his signing up.

3. Because it is a recognized custom and one which seems sufficient.

Against

1. Security is required because it is considered necessary and because the officials must carry out the rules laid down by the Council, as to the sufficiency of the security. We find, however, that on a contract of approximately $25,000, the following situation may arise:—

A. bids $30,000—5% deposit cheque amounts to $1,500.

B. bids $25,000—5% deposit cheque amounts to $1,250.

C. bids $20,000—5% deposit cheque amounts to $1,000.

After the tenders have been opened and before the contract is let, or the bids made public, C. who has been a little anxious about his price and who has a fair idea of who the other bidders are, approaches A. & B. whom he finds responsive. It is too late to change their bids but they compare notes and C. finds himself $5,000 below B. and A. knows he is out of it anyway.

B. pays C. $1,200 if he will withdraw his tender and B. also gives A. $300 as a consolation prize.

B. gets the contract.

C. forfeits his $1,000 but gets out of perhaps losing a contract.

The town loses $4,000 on the deal and B. gives off $1,500 from his profits, leaving him still a chance to make $1,500 to $2,000 on the contract. Everybody satisfied and the town stuck beautifully.

Why is this done? Because an old fashioned antiquated method is persisted in, in ignorance of the modern method of protestation.

Now let us see how a Surety Company bond would work out.

We will suppose the Council has revised its rules and the advertisements for tenders read as follows:—

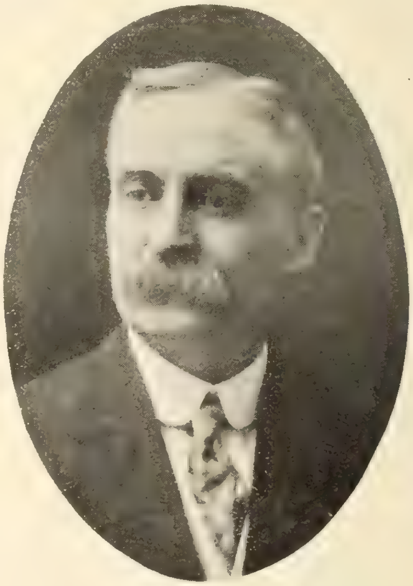
"Each contractor shall be required to file with his tender the written consent of an approved Surety Company to bond him for 25 per cent. of the contract if same is awarded to him."

In this case each contractor, A. B. and C., must take their arrangements for their bonds in advance and nowadays most reputable contractors have a line of credit with their surety companies as they have with their bank.

The bids are signed by the surety company and their bid bond is attached to the tender, the surety company over its own signature agreeing to be bound together with the contractor. C. must accept the contract at $20,000 and completes the work, getting out with a small profit or a minor loss, but the Town has saved $5,000 and the moral tone of the whole community improved by the removal of the temptation to fix things.

A Prominent Consulting Engineer

Mr. Geo. W. Tillson, Consulting Engineer to the Borough of Brooklyn, is a distinguished United States engineer who is one of the official delegates to the forthcoming International Road Congress in London, Eng. He graduated from the civil engineering department of Bowdoin College, Me., in 1877. His first engineering work was done in Memphis, Tenn., in the construction of the sewerage system of that city after the yellow fever epidemics of 1878 and 79, Col. Geo. E. Waring, Jr., having the work in charge. He also assisted in the design and construction of the sewerage system at Kalamazoo, Mich., and later became City Engineer of the City of Omaha, Neb. From there Mr. Tillson went to Brooklyn, N.Y., in 1895, and had charge of the construction of pavements in what was then the city of Brooklyn. In 1902 he was made Chief Engineer of the Bureau of Highways of the Borough of Brooklyn, New York City, and in 1907 was transferred to the same position in the Borough of Manhattan. In 1911 he was made Consulting Engineer to the Borough President, Borough of Brooklyn, the position which he now holds.



Mr. Geo. W. Tillson

Mr. Tillson has been active in engineering societies, having been President of the Nebraska Association of Engineers and Surveyors, of the Brooklyn Engineers' Club, the Municipal Engineers of the City of New York, the American Society of Municipal Improvements, the Organization for Standardizing Paving Specifications, and a Director of the American Society of Civil Engineers. He has contributed many articles to engineering periodicals and engineering organizations. He is the author of a book, "Street Pavements and Paving Materials," published by John Wiley & Sons, New York, in 1900, a second edition of which was issued in 1912. Mr. Tillson is a member of the Zeta Psi Fraternity and the Phi Beta Kappa Alumni Association, of New York City.

We have just received a very artistic catalogue from the Ceresit Waterproofing Company, 446 Commercial National Bank Building, Chicago, showing buildings, aqueducts, etc., all over the world that have been waterproofed with their products. These illustrations are taken from some of the principal cities in England, the United States, Greece, Canada, Russia, Sweden, Denmark, Italy, Switzerland, Germany, Portugal, Holland, Argentine, France, Belgium, India and Austria-Hungary. It also contains recommendations from leading firms, architects, etc., all over the world. The Ceresit Waterproofing Company will be glad to send a copy to any of our readers upon request.

Canadian Contracts for Canadians

Editor, Contract Record: Toronto, June 13th, 1913.

May I bring to your attention the following facts in regard to the Canadian stone business, which may interest you.

A short time ago the Dominion Government (Department of Public Works) called for tenders on a Post Office in Brantford, Ont. This building to to be built of cut stone of which about eighty cars were to be used. Alternate tenders were submitted for the use of Canadian red sandstone and Ohio Brea stone. Although the lowest tender for Canadian stone was but a few thousand dollars above that of the American stone, the tender for the latter was accepted and consequently a United States quarry is profiting by supplying the stone for a public building which the Canadian people are paying for.

As I understand it, the question was one of price only, as Canadian stone could be supplied, and supplied on time. The price too, was a matter of only about five thousand dollars in a building costing about two hundred thousand.

Now, considering the well known fact that it would be utterly impossible for a Canadian quarry to supply stone for a public building in the United States, it does not seem fair that American quarries should have the privilege of supplying stone for Canadian public buildings. Moreover, I understand that most of the work on this stone is to be done in the United States, thereby depriving the Canadian workman from having his fair share of the working up of it.

I will have to admit that the Canadian quarries, not having the tremendously large field of the American quarries, cannot supply stone quite as cheaply as the latter, but even so, should they thereby, be practically prohibited from supplying stone for Canadian public buildings? In connection with the above, I have reason to believe that the price quoted for the Brantford Post Office was considerably below the usual price quoted for this kind of stone.

Very truly yours,

[illegible] K. [illegible]

Personal Mention

The City [illegible] of [illegible] Jaw, [illegible] Mr. L. W. Rundlett, has been appointed City Engineer. He still holds his former position with the municipality.

Mr. Norman K. Hay, who has been construction engineer with the Dominion Iron & Steel Company, has been appointed City Engineer of Sydney, N.S., to succeed Mr. Campbell.

Messrs. J. A. Jamieson, P. W. St. George and F. A. [illegible] have been appointed by the Montreal city council to report as to the suitability of the site selected for the filtration plant.

Mr. John S. MacLean has been appointed to take charge of the publicity and advertising work of the Canadian General Electric Company, Limited, and of the Canadian Allis-Chalmers, Limited, with headquarters in Toronto. The latter company in addition to manufacturing an extensive line of machinery and appliances will also act as sales agents for all the products of the Canada Foundry Company, Limited. Mr. MacLean held a similar position with Allis-Chalmers-Bullock, Limited, for a number of years.

Hon. Thomas Taylor, Minister of Publis Works for British Columbia, has been appointed to represent the government of that province at the meeting of the International Good Roads Congress at London, Eng., which commences June 23.

Mr. Ramsay Traquair has been appointed professor of architecture at McGill University for next session, and Mr. P. W. Ludlow, promoted to the rank of associate professor of architecture. Mr. Traquair is at present lecturer on architecture in the Edinburgh College of Art. Mr. J. G. Dodd, B.Sc., has been appointed lecturer in mathematics and civil engineering, and Mr. J. Creelman, B.C.L., lecturer in railway economics.

Mr. W. Campbell Crockatt, of the firm of W. Crockatt & Sons, consulting, inspecting and contracting engineers and surveyors of Glasgow, Scotland, is on an extended tour through Canada, going from Montreal to Victoria, B.C., and taking in Edmonton and Saskatoon on his return trip. His object is to arrange with consulting engineers to have his firm represent them in Great Britain on tests and inspection of work which they may place there. The firm is also undertaking to act as purchasing agents for contracting firms in the Dominion and claim that in many cases they are able to further the interests of their clients very much, both as to getting better terms and more suitable plant than is possible when dealing by correspondence or through local [illegible]

Canadian Railroad Development

It is expected that the contract for the grading of the Canadian Northern Pacific Railway from a point in the vicinity of Boleskine Rd. to Patricia Bay (Union Bay), its Saanich terminus, will be let in the course of a few days.

The chief solicitor of the Canadian Pacific Railway, Montreal, has filed with the Railway Commission at Ottawa an application for the approval of its plans for the extension of a branch line from Port Moody into North Vancouver.

A three track bridge is to be built by the C. P. R. across the Bow River east of Calgary. It is to be 470 feet long, and will replace the present single track bridge, while another bridge to accommodate double tracks will also be built 25 miles west of Calgary. The latter bridge will consist of two arch spans, 216 feet each. On the Suffield-Kipp branch there will be a bridge 1,035 feet long over the same river.

It is officially stated that the C. P. R. will make a large addition to the shops and other buildings at North Bay, Ont., in the near future. The plans and details of the alterations and additions are not yet fully completed. It is expected that the work will cost in the neighborhood of a quarter of a million dollars, and that the buildings will consist of a repair shop, with a capacity of ten locomotives, and a car repair shop.

Bill has been approved by the Railway Committee of the House of Commons to incorporate a new western railway to be known as the Canadian Northwestern Railway Company. The directors include Lord Howard De Walden, Lord Chinto and Lord Montague de Beaulieu, W. F. Morgan, Jr., of Paris and New York, is another director. [illegible] Harry [illegible] of London, [illegible]

[illegible] As proposed, the road is to run from Winnipeg to Morden; thence through southern Manitoba and Saskatchewan to Lethbridge. The road then to Le Pas, thence south through Dauphin to Brandon, across again to Manitou and to Dominion City. The line proposed strikes northeast to North Battleford, across to Prince Albert [illegible] southwesterly to Glencross and Altona and back to Winnipeg.

According to Mr. W. P. Kellett, general manager and chief engineer of the Lake Erie & Northern Railway, construction work along the line is being pushed forward rapidly. The Northern Division of the road from Brantford to Galt, will probably be completed and in operation by October of this year, and the full line from Galt to Port Dover by April of next year.

Following the completion of steel laying at Port Moody for a distance of five miles in a westerly direction from the head of the Inlet on the north shore, the C. P. R. will start work almost immediately in ballasting the line and making it ready for the operation of cars. Men have already been engaged, and work is expected to start early next week in gravelling the track, thus completing the final stage of linking up the junction of the two shores.

Substantial progress is being made on the Hudson Bay Railway. On twenty miles the grading has been completed and temporary rails are being laid. This will facilitate greatly the forwarding of supplies. The bridge over the Saskatchewan at Le Pas has just been completed at a cost of $300,000 and is one of the big features of the undertaking. By Fall rails will be down permanently on half the line. During the summer the work will be rushed to the Hudson Bay terminals.

A start is being made on the new local terminal facilities of the C. P. R. at Winnipeg. The Westinghouse Church Kerr Company, which has obtained the contract for the work, is engaged in putting up temporary quarters for the men, and the excavation for the hotel extension is under way. The engineer-in-charge states that three hundred men will be employed on the work, and the whole enterprise will be rushed to completion as rapidly as possible. Efforts will be made to have the improvements finished inside two years, and the cost will be approximately a million and a half dollars.

Recent Developments at Edmonton

Preliminary sketches have been prepared for the central market building. The structure will be 52 by 120 feet, two storeys and full basement. Each stall on the main floor will be provided with refrigerator. The fixtures will be of glass and marble. It is expected to complete the building before the close of the year.

The Twin City Realty Company will receive plans soon for a five-storey apartment house, 100 by 110 feet, to be erected at Ninth street and McKay avenue, upon which work will begin this summer. The various floors will be divided into suites, each fitted with bath, gas connections and other modern conveniences.

Mr. A. M. Jeffers, city architect, has submitted plans to the council for a four-storey police station, to cost $175,000. The basement and ground floor will be of stone, the upper storeys being of pressed brick. Thirty-six cells will be built on the top floor. There will be a shooting gallery in the basement and a drill hall and gymnasium on the second floor.

Mr. Bailey Powell, who has large property interests in Edmonton, is consulting architects with a view to erecting a twelve-storey apartment and private hotel building with full basement on Fifth street, between Jasper and Victoria avenues. The cost is estimated at from $500,000 to $700,000, exclusive of fixtures. There will be at least 500 rooms and a roof garden. The house will be equipped throughout with the latest approved modern conveniences. Construction is to begin this summer or early next fall.

From the Saskatchewan Capital

Contracts amounting to about $1,000,000 were recently let for paving and sewage extension work.

A building permit for the new St. Chad's College, which is being erected by the Anglicans on Sixteenth avenue at an approximate cost of $85,000, was taken out on May 28.

The Regina city commissioners are calling for tenders for the erection of a winter fair building. The cost of the building is estimated to be in the neighborhood of $135,000.

It is understood that the proposed new custom house, provision for which was made in the federal estimates, will be erected on the corner of South Railway street and Cornwall street.

The street railway committee of the city council has approved of the city commissioners' recommendation to place the order for paving between street railway tracks with the Bitulithic Paving Company, their tender being $72,956.80, or at the rate of $3.20 per square yard.

The contract for the erection of the new Regina jail has been let to the Parsons Construction Company, of Regina, their tender being $206,900. Building materials will be assembled and put on the ground immediately and work will be commenced on the erection of this building as soon as the contractors can get their camps together. The building will be of reinforced concrete and will be as nearly fireproof as modern engineering can devise. There will be accommodation for 150 persons, separate quarters being provided for female prisoners.

Mainly Constructional

The News in Brief—From Coast to Coast

Plans have been prepared and tenders called for the public building at Collingwood, Ont.

The town council of Galt, Ont., have decided to spend $70,000 on a waterworks system.

Westmount, P.Q., Council have decided that elevators are to be installed in all new three-storey apartments or store tenements.

The building permits issued for the first week in June at Edmonton exceed those issued for the corresponding week of last year by $495,000.

City Engineer Fellowes, of Vancouver, B.C., recently placed before the board of works of that city an alternative plan to that submitted by Mr. T. H. Mawson for the improvement of Coal Harbor.

Building operations are now in full swing at Halifax, N.S., and the many large contracts that have already been given out are expected to keep the building mechanics fully employed for the rest of the season.

Building operations at Amherst, N.S., are very active. Several large factories are being erected and large sums are to be spent on permanent streets and sidewalks. Dredging work has commenced again in Amherst harbor.

Building permits at Vancouver for the last week of May practically doubled the value of the permits issued for the first three weeks of the month. The amount for the last seven days was $621,177, and the total for the month $1,020,597. The largest building for which permit was issued during the month was that for the Credit Foncier Franco-Canadien, ten storeys high on Hornby and Hastings streets, to cost $350,000.

Arrangements have been completed for the construction of a garden city in the neighborhood of the twin boulevards of the aqueduct, Montreal.

Colonel Cruickshanks, of Calgary, district officer commanding the Alberta militia, announces that plans are in the custody of the public works department for a new armory for the 101st Regiment Edmonton Fusiliers.

The city council of Prince Albert have asked their city engineer to prepare an estimate for a new water system, their present supply being totally inadequate. It is expected that the cost will not be less than $100,000.

Owing to the fact that considerable quantities of water have been sold outside the city limits at a heavy loss, the Board of Control of the city of Toronto recently decided not to sell any further supplies of water under present conditions.

Mr. Louis Mosenberg, of New York, has taken an option for sixty days upon a building site on Whyte avenue, Edmonton south, where he plans to erect a building, to form part of a chain of theatres throughout the province of Alberta.

A petition has been sent to the city council, Regina, asking that an overhead footbridge be built across the Canadian Pacific Railway tracks at Cornwall street. The bridge, if it is built, will be similar to that at Hamilton street, which will cost about $35,000.

Tenders have been called for, for the first three miles of the new Welland Canal, starting from the Lake Ontario end. The tenders will be opened on July 17th, and it is expected to have work begun by August. The total cost of the new canal is estimated at $55,000,000.

City of Toronto, Ont., has retained R. A. Ross, Montreal, Que., J. W. Moyes, Toronto, and J. C. Forman, Toronto, to report on the value of the Properties of the Toronto Railway Company and the Toronto Electric Light Company, with a view to their purchase by the city.

Official announcement was made at a hearing before the Railroad Commission recently that the Grand Trunk Pacific and the Canadian Northern Railway Company have signed an agreement to erect union freight houses here. Construction work will begin as soon as the materials are assembled.

Plans are now being prepared for a sulphite pulp mill in Northern Ontario for the Riordon Pulp & Paper Company, Montreal. The mill, which will have a capacity of 30,000 tons per annum, will enable the company, with their other plants, to turn out a tonnage equal to any on the American continent.

Mr. E. A. Schofield, a member of the firm of Jones & Glassco, St. Nicholas Building, Montreal, was married on May 31st to Miss Leonard, daughter of Mr. F. E. Leonard, of the firm of E. Leonard & Sons, Limited, London, Ont. The marriage was celebrated at the Memorial Church, London.

The various government departments at Ottawa are busy preparing plans and estimates for the Public Works, aggregating millions of dollars, voted in the session that has just closed. Several members of Parliament have stayed over to facilitate the commencement of the operations they are interested in and many contracting firms have representatives there.

Two million and a half dollars for road building in Burnaby, B.C., was the suggestion made recently by Municipal Engineer McPherson of that Municipality at the regular meeting of the Burnaby Board of Trade. Mr. McPherson stated that, while the initial cost of such work seems alarming and is, of course, out of all proportion with the existing borrowing power of the municipality, spread over a period of, say, five years, the investment should be a sound one, in as much as the work would be permanent. The average annual cost of maintenance, say $50,000, at the end of that period would be practically eliminated and the needs of every district would be served.

The introduction of a bylaw to place the control of the waterworks in the hands of a commission was recommended to the city council of Ottawa by the board of control recently, with the remark that this step should be taken at the earliest possible moment. This is in accordance with the special act of the city passed at the last session of the Ontario legislature.

Notwithstanding a decision of the Montreal Council that no place of business or hall shall be erected on Esplanade Avenue, the Militia Department have ordered the contractor to go ahead with the construction of a drill hall on that thoroughfare. No building permit has been applied for, and it is admitted that the city have no power to prevent the erection of the building.

A seven-million dollar boulevard system for Toronto, with a total length of 42 miles, was projected in the Parks and Exhibition Committee recently and a special committee was selected to investigate the plans and proposition made by Parks Commissioner Chambers and report on them. The boulevard planned will provide Toronto with one of the most elaborate systems on the continent.

For the year ended December 31, the Canadian Fairbanks-Morse Company earned net profits of $390,303, and in addition $307,615 was brought forward. After paying preferred and common dividends, $520,805 is left. Surplus and reserve funds now amount to $677,487 and total assets, after deducting current liabilities, amount to $3,767,487, of which the sum of $2,918,583 is represented by liquid assets.

The test being made at the mechanical filtration plant on Ellis avenue, West Toronto, will be finished shortly, and from the results obtained Commissioner Harris will be in a position to know upon what lines to report to the Board of Control respecting the extension of the Island filtration plant. The information to be gained is whether a combination of slow sand and mechanical filtration is better than the slow sand process now in use at the Island.

A very large steel and forging plant, in which British capital will be invested, is to be constructed at Longueuil, opposite Montreal. Mr. M. J. Butler, former Deputy Minister of Railways and Canals, and afterwards general manager of the Dominion Iron and Steel Company, is to be President of the company. The plant will have an immense frontage on the St. Lawrence and the first outlay will be about a million dollars. It is proposed later to make armour plate for battle-

The business of the Goulds Pump Company of Canada Limited will, on and after July 1st, be carried on under the name of Storey Pump & Equipment Company, Limited. The present offices at Montreal and Toronto, Ont., and the personnel of the company will not undergo any change whatever. This concern handles a very complete line of pumping machinery consisting of turbine and centrifugal pumps, triplex power pumps, rotary pumps, steam pumps, hand pumps, and a complete line of contractors' pumps, and hydraulic dredging machinery.

After twenty years of more or less continuous construction work the finishing touches are now being put on the southern portion of the Trent Valley Canal. A contract has just been awarded by the Government to Messrs. Roger Miller & Sons, of Toronto, for the lock gates on sections three and four of the canal, thus completing the outlet to Trenton on the Bay of Quinte from Lake Simcoe. Tenders will be called shortly for beginning the work on the northern section of the canal from Lake Simcoe to Georgian Bay, via the Severn River. The total expenditure on the canal so far has been about $[illegible]. It will cost another $5,000,000 to complete it and give a continuous six to seven foot waterway from Georgian Bay to Lake Ontario.

Messrs. Norton Griffiths & Company are securing two additional dredges for the work in Courtenay Bay, St. John, and expect to have them ready for work in a short time. The government has made a change in the construction of the outer end of the Courtenay Bay breakwater specifications, and instead of a crib core the work will all be of rubble construction; 2,300 feet of the total length of 4,570 of the breakwater has been completed and the whole structure should be finished by the middle of next summer. The contractors are now employing 350 men, and expect to increase this number.

The net earnings of the Dominion Steel Corporation during the past financial year totalled $4,714,057.77, out of which $1,009,050.61 was set aside for depreciation, sinking funds, etc. Besides providing for all charges and dividends, the reserve funds and surplus were increased by $1,272,199.95. Although the first part of the year was unprofitable, better prices were afterwards obtained for the company's products. Subject to unforeseen developments, it is proposed that for some time to come the energies of the staff shall be devoted to the development of the steel plant as now completed, and that no further extensions shall be undertaken until the existing plant has been brought to the highest efficiency.

The worst enemies of rubber are heat and oil. Manufacturers of automobile tires realize these points most keenly. The Goodyear people say a properly balanced tire will not heat. Experiments in making very thick, heavy tread tires have shown that the resulting heat generated breaks the tires down very quickly, especially on the side walls and once a tire has a badly broken down sidewall there are slight chances of properly repairing it to give any length of service. It is pointed out that leaving a car standing on an oily floor is one of the quickest ways of rotting the tires. If the motor car owner wishes to get the best service out of his tires he must keep his garage floor clean and quickly wipe off the tires any oil that may get on them through accident.

Mr. Francis Hyde, president of Hyde & Sons, Limited, builders' supplies, died in Montreal on June 8th, after one day's illness. Mr. Hyde, who was a prominent business man, was born in Ireland 68 years ago, and was for some years connected with a Scottish Colliery firm. On coming to Canada he established the firm of Hyde & Company, which undertaking was absorbed by Peter Lyall & Sons, and later again took the name of Hyde & Webster. A dissolution of partnership recently took place, and the business was re-constituted under the name of Hyde & Sons, Limited. He leaves a family which includes Joseph, American representative of Orenstein-Arthur Koppell Company; George, a director of the company; Stanley, in Western Canada; Frank and James, of Montreal; and Miss Laura Hyde.

Clemesha & Portnal, the Regina architects, who were awarded first place in the competition to supply plans for the Winnipeg city hall, have been awarded first place in a similar competition to supply plans for the Regina police station. The adjudicators were Mr. Percy Over and Commissioner Thornton. The plans of the competitors were placed in the hands of the adjudicators several days ago, and not until after the award had been made were they aware of the successful architects' names. Clemesha & Portnal, on the evening on which their second success was announced, were presented with an illuminated address by the Regina Board of Trade as a mark of appreciation of their success in the Winnipeg competition. The cost of the police station is estimated at $135,000, an additional $5,000 being allowed for the making of fences, walks, etc., in such a manner as to be in uniformity with the building.

A new record in tunnelling on the American continent has been made at the Mount Royal tunnel of the C. N. R., Montreal. A total of 810 feet of heading was completed in 31 days, which is only surpassed by the work on the Loetschburg tunnel, Switzerland. The men were at work day and night for the period of 31 days, never ceasing, except on Sundays, and at the completion of the record the length of the tunnel was 3,750 feet. In future the progress will not be so great owing to the harder nature of the rock. To celebrate the event, the men were entertained, over 300 being present. Those who were responsible for the attainment of the record and who are in charge of the work, are: Mr. S. P. Brown, managing engineer for MacKenzie, Mann & Company, Limited, and chief engineer of the tunnel; Mr. H. T. Fisher, tunnel engineer. The heads of the different departments are: Mr. E. Duffy, general superintendent of the east heading; Mr. W. C. Lancaster, electrical and mechanical engineer; Mr. H. D. Robinson, designing engineer, and Mr. J. C. K. Stuart, first assistant engineer.

In Regina, 195 permits were issued for buildings during the month of May last, at an estimated value of $513,790. For the corresponding month of 1912 permits were issued to the value of $407,415. The total value of permits for 1913 to date is $1,915,135, and for the corresponding period of 1912 was $1,500,940. A very noticeable feature of the permits this year is the absence of large buildings, and the large number of workmen's dwellings erected at a cost ranging between $300 to $2,000. The following is a comparative statement of building permits in the city of Regina from January 1st to May 31st, 1912-1913.

	1912	1913
Approximate value of buildings January 1st to May 31st	$9.902,505	$11,697,482
Approximate value of buildings for the month of May	3,393,680	2,915,392
Number of building permits issued January 1st to May 31st	2,182	3,135
Number of buildings for which permits were issued for the month of May	1,143	1,271
Number of new buildings erected January 1st to May 31st	3,383	4,311

The record of building permits in the city of North Battleford, Sask., for May would indicate that there is sufficient money available for legitimate development, being $213,605, as compared with $48,335 for the corresponding month of last year—an increase of 341 per cent. This remarkable increase is more noticeable owing to the reported quietness in real estate; few, if any, second payments have been missed on properties within the city limits. Construction has commenced on the new government building to contain Post Office and Customs House, costing $65,000. The International Harvester Company will commence building by about June 15th a five-storey warehouse, for which the contract has been let, it is reported for approximately $125,000. A new four-storey hotel is nearing completion, and nearly one hundred private buildings are under way, either actually building or being contracted for. A very important branch railway from North Battleford to Prince Albert, which has been under construction some years, Sir William McKenzie, president of the Canadian Northern Railway, now states will be completed by August. This opens up additional valuable territory for the distributing warehouses, but more especially it will be the means whereby a large amount of grain which has been held up in the district can be moved out.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Clinton, Ont.

Council has decided to lay Tarvia on streets to repair pavements. Will also purchase tile to repair several drains. Clerk, D. L. Macpherson.

Esquimalt, B.C.

Sewerage construction under contemplation. Clerk, Thos. Shepherd. Council is preparing by-law.

Essex, Ont.

Concrete pavements planned by the town council. Mayor, Mr. Bowie. Clerk, Geo. E. Wightman.

Herdman, Que.

Macadamizing roads for Municipality of Hinchinbrook. Specifications and plans on application to Secretary, Wm. Anderson, Herdman, Que. Tenders for macadamizing 30 miles of road in municipality received by Secretary until June 20th.

Maple Creek, Sask.

Town council contemplate purchasing iron or steel water pipe. One mile 10 in. pipe and crosses 6 in. off 10 in. and 8 in. off 10 in.; T's 6 in. off 10 in. and 8 in. off 10 in.; 1½ miles 8 in. pipe and T's and crosses 6 in. off 8 in.; 1½ miles 6 in. pipe, with necessary valves. To replace wooden pipe within town limits. Sec.-Treas., D. Paterson. Engineer, T. A. Barnett.

Merriton, Ont.

Seven miles of sewers, cost $35,000 under contemplation. Clerk, Richard Clark. Plans ready.

Montreal, Que.

Sewers planned by town council of Pointe Claire. Engineer, V. H. Dupont, 225 St. James street, Montreal. Tenders to be called shortly.

Orillia, Ont.

Waterworks extension planned by Town Council (Water, Light & Power Commissioners) Chairman, E. Long. Sec.-treas., F. Grower. Town engineer, W. K. Greenwood. Tenders received by chairman until June 30th. (a) pipe laying; (b) pump house; (c) furnishing cast iron pipe and specials; (d) furnishing gate valves and hydrants; (e) pumping machinery; (f) reinforced concrete receiving basin; (g) furnishing 150 h.p. H. R. T. boiler; (h) electrical equipment. Plans and specifications at office of engineer and "Canadian Engineer," 62 Church street, Toronto.

Ottawa, Ont.

Pavement, cost [illegible], King Edward ave. and Chapel, planned by city council. Mayor, J. A. Ellis, on Clarence street between. Engineer, F. C. Askwith, City Hall.

Point Claire, Que.

The town engineer has been [illegible] to prepare plans and specifications for construction of boulevard from Beaconsfield to Dorval, about 75 ft. wide.

Watermains planned by town council of Point Claire. Engineer, V. H. Dupont, 225 St. James street, Montreal. Tenders to be called shortly.

Saskatoon, Sask.

Intercepting sewer for City Commissioners. Mayor, F. E. Harrison. City Engineer, F. E. Clark. Secretary, Geo. Johnstone. For construction, material and labor for 3,400 lin. ft. earth excavation and building 36 in. reinforced concrete pipe sewer, 2,478 lin. ft. earth excavation and building 30 in. reinforced concrete pipe sewer. Plans, specifications, etc., at office of Engineer.

St. John, N.B.

Sewerage system, cost $35,000, Lancaster Parish, planned by County Council. Address King Kelly, Richie Bldg., Princess street. Engineer, G. Gray Murdock, Leinster street. Tenders will be called next week.

Steelton, Ont.

Sewer construction, cost $17,300. Mayor, James Lyons. Clerk, Jas. Robinson. Engineer, W. B. Redfern. 4,206 ft. sanitary sewer pipe, 2,150 ft. stave wood pipe, 10 in. force main. Plans under way.

Tillsonburg, Ont.

Council plans to lay new macadam roadways, a number of cement walks and make repairs to some old walks. Mayor, Mr. Ross.

Toronto, Ont.

Concrete sidewalks on a number of streets, cost $35,000, recommended by the Board of Control. Commissioner of Works, R. C. Harris.

Commissioner of Works, R. C. Harris, recommends pavements on number of streets. Material—asphalt, brick, concrete, cost $102,000, and concrete sidewalks to cost $35,000.

Commissioner of Works, R. C. Harris, has recommended grading on Glenholme Drive, Sparkhall, St. Clair and Pendrith, [illegible]

Valleyfield, Que.

Council is negotiating for loan of [illegible]000, for macadamizing roads and laying cement sidewalks. Mayor, S. H. Ostiguy.

Winnipeg, Man.

Tenders received by Chairman, Board of Control, till 11 a.m. June 19th, 1913, for construction of granolithic walks on several streets. Specifications, etc., at office of Engineer, H. N. Ruttan, 223 James ave. Secretary, M. Peterson.

CONTRACTS AWARDED

London, Ont.

Asphalt pavements, cost [illegible]. Mayor, C. M. R. Graham. General contractors, Foley & Gleeson, Ottawa. Pavement on Waterloo street from Queen to King $6,300, pavement on Queens ave., Maitland to Adelaide street, $10,000.

Oshawa, Ont.

Sidewalks, cost $5,000, for town council. Engineer, Frank Chappell. General contractor, J. C. Conory, Canora, Sask. 25,000 sq. ft. concrete sidewalks at 10c. per sq. ft.

Pavements, cost $15,000, for town council. Engineer, Frank Chappell. General contractors, Messrs. J. W. McCutcheon & H. B. McConnell. $1.12 per sq. yd. complete, 35c. curbing per lin. ft.

Ottawa, Ont.

Asphalt pavements planned by city council. Mayor, J. A. Ellis. Engineer, F. C. Askwith, City Hall. Pavements on Clarence and Adelaide streets awarded to the Union Construction Co., Bank street. Pavements on Rupert and Church streets, Ottawa Construction Co., Central Chambers.

Regina, Sask.

Watermains for City Council. Clerk, A. W. Pool. Engineer, F. McArthur. Contracts were awarded to The Sykes Co., Neepawa, Man., for trunk mains, $51,049.71; M. S. Holmes Souris, Man. Northwestern Sec., $14,520.60; John Brodt, for S.W. Section, $20,054.55, and east end and wholesale dist., $16,704.74.

Winnipeg, Man.

Reservoir, Logan ave., for Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. Contract awarded to W. H. Thornhill, Chambers of Commerce Bldg., for waterproofing compound, 68,250 lbs., at 14½c. lb. Total, $9,896.25.

Woodstock, Ont.

Concrete walks planned by city council. Clerk, Jno. Morris. City Engineer, F. J. Ure. General contractors, Silica Barytic Stone Co. of Ontario, Ingersoll, Ont. 10c. per sq. ft. for walks, and 14c. for crossings.

Railroads, Bridges and Wharves

Beloeil, Que.

[illegible] planned by Municipality of Beloeil, Co. Vercheres. Tenders received by Sec.-treas., J. Albert Jeoffrion, Beloeil. One span, 26 x 18, 5ft. 8 in. beams at 55 lbs., 30 ft. long, two concrete abutments.

Corwhin, Ont.

Station for Canadian Pacific Railway. Head office, Montreal. Plans ready.

Ft. William, Ont.

Freight shed, cost $7,000, river front, for Imperial Oil Co., Ltd. One storey, 400 x 50, frame and galvanized iron construction, galvanized iron roofing. Plans prepared.

Montreal, Que.

Bridge over Little River, for Municipality [illegible]

[illegible] A. Paradis. One span, [illegible] and steel construction.

Oneida, Ont.

Culverts in township of Oneida. Specifications and plans at office of Clerk, [illegible]. Tenders received by Clerk until June 21st.

Ops Twp., Ont.

[illegible] County Council contemplate rebuilding West Cross Creeks Bridge. Clerk, J. R. McNeillie, Lindsay, Ont. [illegible] Lindsay.

Port Hope, Ont.

Revetment wall, cost $30,000, planned by Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Work to be started shortly.

Ste. Philomene, Que.

Steel bridge over Deep River planned by Municipality of Ste. Philomene, 8th Range, Co. Lotbiniere. Tenders will be received by Sec.-Treas., [illegible]ville, Co.

CONTRACTS AWARDED

Twp. of Anderdon, Ont.

Bridges for Twp. Council. Clerk, A. C. Mailloux, Gordon, Ont. General contractor, W. G. H. Pettypiece, Amherstburg. Cement bridges for the Long Marsh Drain.

Twp. of Puslinch, Ont.

Bridge for Twp. Council. Clerk, A. B. Falconbridge, Aberfoyle, Ont. Engineers, Malcolm & Rudd, Guelph. General contractor, H. E. Crojt, Aberfoyle.

St. John, N.B.

Substructure bridge, Reversing Falls, for Prov. Govt. Dept. of Public Works. Minister, Hon. John Morrissy, Fredericton, N.B. General contractors, Jos. McVey & Son, St. Stephen, N.B.

South Edmonton, Alta.

Addition to round house, 2nd street east, for C. P. R. General contractors, Carter-Halls-Aldinger & Co., Union Bank Bldg., Winnipeg. Addition of 6 stalls, 1-storey, 100 x 50, brick construction.

Winnipeg, Man.

Addition to station and hotel for Canadian Pacific Railway. Architects and general contractors, Westinghouse, Church, Kerr Co., 611 Confederation Life Bldg. Twelve storey wing addition, structural steel, stone and pressed brick construction.

Public Buildings, Churches Schools, etc.

Banff, Alta.

School, cost $30,000, under contemplation of the Board. Tenders received by Architects, Lang & Major, Board of Trade Bldg., Calgary, Alta. Two stys. and basement, frame, cobblestone, concrete and stucco construction.

Broadview, Sask.

Addition to school planned by Public School Dist. No. 5. Plans, specifications, etc., at office of Secretary, W. H. Macdonald and Architect, R. B. Bunyard, Moose Jaw. Tenders received by Secretary until June 25th.

Calgary, Alta.

Laboratory, cost $12,000, for City Council. Clerk, J. M. Miller. By-law passed by large majority.

Incinerator, cost $30,000, for city council. Clerk, J. M. Miller, Engineer, J. T. Child. An incinerator capable of dealing with 75 tons of rubbish every 24 hours. By-law passed by large majority.

Industry house building, cost $250,000 9th avenue and 5th street west, for city council. Clerk, J. M. Miller. Architect, Alex. Pirie, Board of Trade Bldg. Six storeys and basement, 100 x 130. By-law was defeated but will be put forward again and another vote taken at an early date.

Picture theatre, cost $10,000, Balmoral, for Harrison Ponton & Barker, Beveridge Block. One storey, 125 x 25, cement foundation, terra cotta and brick construction. Plans prepared.

East London, Ont.

Orphanage, cost $10,000, contemplated. Address Rev. T. B. Clarke, in trust, Hamilton road and Inkerman street.

Elmira, Ont.

Public building for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until 4 p.m. July 2nd. Plans, specifications, etc., at office of Postmaster, Elmira, Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, and at Dept., Ottawa.

Esquimalt, B.C.

Town hall, cost $15,000. Clerk, Thos. Shepherd. Architect, Thos. B. Sedger, has submitted plans to the council. 2½-storeys, 50 x 52, frame construction.

Franklin, Man.

Heating system in 2-room school planned by Trustee Board of Franklin Union S. D. No. 780. To be installed during the holidays. Tenders received by Sec-Treas., Samuel W. Wiley, till June 20th.

Lindsay, Ont.

County Council contemplate extension of heating system in jail. Clerk, J. R. McNeillie, Lindsay. Warden, A. E. Bottum, Bobcayson. Reeve, R. Kylie, Lindsay.

Medicine Hat, Alta.

Church for The St. Johns Presbyterian Church Congregation. Pastor, J. W. Morrow. Plans under consideration.

Milltown, N.B.

Public building. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until June 24th. Plans, specifications, etc., at office of D. H. Waterbury, Supt. of Buildings, Post Office Building, St. John, Post Office, Milltown, and at Dept., Ottawa.

Montreal, Que.

Tenders received by R. C. Desrochers, Secretary, Dept. of Public Works, Ottawa, until July 2, for construction of Postal Station "L." Plans, specifications, etc., at office of Alphonse Piche, 52 Victoria Square, Montreal and this Department. Cheque for ten per cent. payable to Hon. Minister of Public Works, must accompany each tender.

Church, cost $25,000, for St. Henri Parish. Architect, L. J. T. Decarie, New Birks Bldg., Montreal. 50 ft. high, 180 x 50. Wall of church to be changed. About 360 ft. of brick, stone and terra cotta required. Tenders called by architect next week.

Alterations and addition to post office, cost $8,000, Lachine, for Dom. Govt. Dept. of Public Works. Architect, Dalbe Viau, 76 St. Gabriel, Montreal. One storey, 30 x 40. Tenders received by Secretary, R. C. Desrochers, Ottawa, until June 30th.

New Hamburg, Ont.

Library, cost $12,000, for town council. Clerk, J. F. Katzemeir. Architect to be selected. Site has been purchased and plans are being prepared.

Ottawa, Ont.

Church, Sunnyside, for Presbyterians of Ottawa South. Architect, J. Albert Ewart, 193 Sparks street, is preparing plans.

Port Arthur, Ont.

Interior fittings, post office. Tenders received by Secretary, Dom. Government, Dept. of Public Works, R. C. Desrochers, Ottawa, until June 30th. Plans, specifications, etc., at office of Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, D. McKenzie, Caretaker, Port Arthur, and Department, Ottawa.

Preston, Ont.

Public Building. Tenders received by Dom. Government, Dept. of Pub. Works, R. C. Desrochers, Secretary, Ottawa, until July 2nd. Plans, specifications, etc., at office of Thos. Hastings, Clerk of Works, Postal Station "F," Yonge St., Toronto, Post Office, Preston, and Department, Ottawa.

Paris, Ont.

Interior fittings, post office. Tenders received by Secretary, R. C. Desrochers, Ottawa, Dom. Govt. Pept. of Public Works, until June 19. Plans, etc., at office of Geo. W. Wheeler, Clerk of Works, Paris; T. A. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, and at Dept., Ottawa.

Stratford, Ont.

Addition to House of Refuge for County of Perth (Wm. Davidson, Stratford). Architect, Thos. Hepburn, is preparing plans.

St. Catharines, Ont.

Parish hall for Christ Church Congregation. Pastor, Rev. L. W. Broughall, 124 King street. Tenders received by Architect, Jos. Daw, 1-5 St. Paul street, until June 21st.

Shelburne, Ont.

Public building, for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, up to 4 p.m. June 30th. Plans, specifications, etc., at offices of J. M. Vance, K.C., Shelburne, Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, and at Dept., Ottawa.

Toronto, Ont.

Theatre, cost $7,000, Dovercourt, for Adam Bailie, 7 Russet ave. Two storeys, 25 x 110, structural steel and brick construction, brick foundation. Plans drawn.

Theatre, cost $25,000, for C. Dunning, Yonge street. Tenders received by Architect, C. J. Read, 404 Confed. Life Bldg. One storey, 30 x 130, structural steel and brick construction, brick foundation.

Theatre, cost $6,000, Dundas, for A. Rappaport, 2163 Dundas. Architect, T. A. Fleming, 94 Laws. Two storeys, 28 x 125, structural steel and brick construction. Plans ready.

Sunday school addition, cost $5,000, College, for Broadway Tabernacle, College and Spadina. Pastor, Rev. W. H. Hincks, 53 Brunswick Ave. Architect, G. M. Miller & Company, 93 Yonge St.

Structural steel and bridge construction. Plans prepared.

Windsor, Ont.

Collegiate Institute Board is considering installation of new heating and ventilating systems. Secretary, Alex. Black.

Winnipeg, Man.

Church, Burnell & Alverstone, for Ebenezer Evangelical Church. Pastor, Rev. E. J. Bechtel, 335 Ellice ave. Architect, E. D. Tuttle, 701 McArthur Building. Brick construction.

Church, cost $12,000, for St. Martins Church, Seven Oaks, Canon Gill, 5 St. Cross street. Architect, E. D. Tuttle, 701 McArthur Building. Frame construction. Plans ready.

CONTRACTS AWARDED

N. Dorchester, Ont.

School, cost $3,800. Architect, A. E. Nutter, Dom. Bank Bldg., London. General contractor, C. N. Carruthers, 414 Grosvenor, London.

Edmonton, Alta.

Church, cost $4,000, Namayo ave., for Ruthenian Catholic Church, Namayo ave. Architect, A. J. McCormick, Gen. Del., Edmonton. General contractor, G. G. Pelletier, Gen. Del., Edmonton. 1-storey, 40 x 96, concrete, brick foundation, frame construction.

Ft. William, Ont.

Addition to school, cost $24,000, Ogden, for Board of Education. Architect, R. E. Mason. General contractor, Chas. E. Ward.

Addition to Kamistikwia Club House, cost $20,000, George street planned. Architect, Carl Wirth. General contractors, Marsh & Powers. Two storeys, 45 x 90, pressed and common brick construction, stone and cement foundation.

Picture theatre, cost $15,000, Simpson, for Ben Ross, Corona Theatre. Architects, Wirth, Carson & Smithley. Engineers, Marsh & Powers. General contractors, Alberta Land Company, Port Arthur.

Addition to school, cost $15,000, Isabella, for Board of Education. Architect, R. E. Mason. General contractor, Chas. E. Ward.

Guelph, Ont.

Masonic Temple, Queen street, planned. Architects, Colwill, Tanner Company. General contractor, George A. Scroggie, $16,000. Electrical, A. Malcolm.

Hamilton, Ont.

Firehall, cost $20,000, Balmoral. Mayor, John Allan. Architects, Stewart & Witton, H. P. & L. Bldg. Carpenter, J. Huckson, 142 Belview. Foundations in.

School, cost [illegible] Cannon street east, planned by the Board of Education. Secretary, R. H. Foster. Architect, A. W. Peene, Clyde Block. General contractor, W. H. Yeates, 24 Leeming street.

London, Ont.

Addition to hospital, cost [illegible] for Victoria Hospital Trust. Supt., T. H. Heard. Architects, McBride & Fairfield. Mason, carpenter, roofing and painting, C. Insell, $10,199. Plumbing, Noble and [illegible]. Heating and electric work to be let.

Medicine Hat, Alta.

Club house, cost [illegible] for The Medicine Hat Golf & Country Club. Architect, W. T. Williams, Porter Block. General contractors, Scanlon & Hall, 44 x 59. Work will start immediately.

Church and residence, cost $10,000, Altawana Sub-Div., for The St. Patricks Catholic Church Congregation. Priest, Father Cadoux. General contractors, Purdy & Henderson.

Montreal, Que.

Church, cost $80,000, for Fabrique of St. Francois Xavier, Longue Point. Architects, Gauthier & Daoust, 180 St. James street, Montreal. General contractor, Jos. Fauteux, De l'Epee and Laurier Ave. Steel, Phoenix Bridge Co., 83 Colborne street. General contractor will call for other trades later. 50 ft. high, 100 x 60, stone construction, cement foundation.

Church, cost $150,000, Westmount, for Presbyterian Congregation. Pastor, Rev. W. D. Reid, 21 Lincoln Apts., Montreal. Architects, Hutchison, Wood & Miller, 50 Royal Ins. Bldg., Montreal. Brick, Reid, McGregor & Reid, 14 Guy Block. Woodwork and carpenter, T. S. Hudson & Co., 612 Board of Trade. 90 x 92.

Church, Rosemount, for Presbyterian Institute, Montreal. Architects MacVicar & Heriot, 104 Union Ave. Fire escape, F. A. McKay, 18 St. George St. Carpenter, Paton, Laird & Son, Ltd., 485 St. James. Glazing and painting, Geo. E. Blackwell, 4184 St. Catherine. Heating and plumbing, W. J. Graham, 85 Cathcart. Electric, C. Lapierre, 419 Lindsay Building. Tile, Robt. Mitchell Co., Belair Ave.

Moose Jaw, Sask.

Y. W. C. A., Ominica West. Pres., Miss Lester. Architects, Reid & McAlpine, Room 6, Howden Block. General contractors, Navin Bros., Hammond Building. Four storeys, 50 x 100, concrete construction.

North Battleford, Sask.

Collegiate, cost $150,000, for High School Board, Hodson Block. Architect, David Webster, 4 Kempthorne Blk., Sask. General contractor, J. W. Holdsworth. Three storeys, 110 x 70, vacuum cleaners, seating.

Toronto, Ont.

The Canadian Supply and Contracting Co., Ltd., 220 King street west, have been awarded the contract for the waterproofing of the foundations for the Technical High School, Toronto. Norcross Bros., general contractors, 98 Bay street. Contract for steel casements awarded to Henry Hope & Sons, 45 King street west.

Woodrooffe, Ont.

School, cost $12,000, for Public School Board, Sec. No. 1, Nepean, Westboro. Architect, C. J. Burritt, 193 Sparks St., Ottawa. Plasterer, Hugh McNaulty, King Edward ave., Ottawa. Masonry, Murphy Bros., Arthur street, Ottawa. Carpentry, H. Richards & Co., Ottawa. Iron, J. E. Sheppard, 261 Albert, Ottawa. Painting, W. J. Carson, 293 Laurier W., Ottawa. Heating and plumbing, John Stewart, Westboro. Electrical, T. E. Hopson, Wellington street, Ottawa. Fire escapes, J. E. Ellard, Nicholas St., Ottawa. Solid brick construction.

Business Buildings and Industrial Plants

Acton Vale, Que.

Factory contemplated by Alfred Lambert, Ltd., 11 Notre Dame east, Montreal. Architect no chosen. 100 h.p. steam boiler.

Davidson, Sask.

Heathfield, Hammond & Thomas Co. has decided to erect brickmaking plant.

Edmonton, Alta.

Addition to store, Jasper ave., for Master Piano Co., Jasper Ave. Two additional stores to be built at the rear of their present building, for repair work. Plans ready.

Warehouse, 2nd street and Columbia avenue, for H. H. Cooper, c/o A. MacDonald & Co. Owner intends to start work shortly.

Hamilton, Ont.

Alterations to store, cost $5,000, York, for Duff Stores, Ltd., c/o Chas. Duff, York street. Architects, Watt & Blackwell, Lister Chambers. 60 x 40. Plans prepared.

Hazelton, B.C.

Hotel. Owner's name withheld. General contractor, Mr. Harvey. Three stys., brick construction, electric lighting.

Medicine Hat, Alta.

Alterations to store for [illegible] & [illegible], 4th and Toronto streets. To be used as hardware store.

Moose Jaw, Sask.

Bank, Main street, for Bank of Nova Scotia, c/o Manager. Two storeys, 50 x 100, brick and fireproof construction Plans under way.

Montreal, Que.

Steel forging plant, cost $1,000,000, under contemplation. Manager, M. J. Butler, 22 Victoria Sq., Montreal. To employ 5,000 men. One mile of water front purchased.

Bank, cost $45,000, St. Lawrence and Mt. Royal, for Bank of Montreal. Architects, Barott, Blackader & Webster, New Birks Bldg. Two storeys and basement, 40 x 70, brick and limestone construction, cement foundation. Tenders called after July 1st by architect.

Ottawa, Ont.

Stores and residences, cost $6,000, for J. B. Charotte, Montreal road, Eastview. Brick construction, cement foundation. Plans in progress.

Factory, cost $20,000, Nelson, for Crown Lithographing Co., Wellington street. Solid brick construction, cement foundation. Tenders received by owners.

Peterboro, Ont.

[illegible] Marble Co. Assistant Treas., A. W. Edson. One storey, 64 x 212, cement foundation, frame construction, felt and gravel roofing. Plans in progress.

Sherbrooke, Que.

[illegible] loss $3,000. Will rebuild immediately. Two storeys, 40 x 20.

Toronto, Ont.

One pair stores and residences, cost $8,000, Queen, for L. O. Lumbers, Crescent and South Drive. Architect, D. B. Bowerman, 5 Lamport. Two storeys, [illegible] construction. Plans ready.

[illegible] E. A. Vansickler, 199 Yonge street. Architects, Eden Smith & Sons, 199 [illegible]

[illegible] steel, reinforced concrete and [illegible] construction. Plans ready.

Truro, N.S.

[illegible] store and hall, cost $25,000, [illegible] Independent Order of Odd [illegible]. Two storeys, 90 x 60. Plans being considered.

Waterloo, Ont.

[illegible] Quality Mattress Company (Messrs. Dantzon & Montague, Berlin). By-law to loan firm $10,000 will be voted on shortly.

Windsor, Ont.

Store and flats, London street west, for A. St. Denis, 155 London street west. Architects, Atcheson & Adams, Room 1, Thompson Building. Architects wish plumbing catalogues.

Winnipeg, Man.

Warehouse, cost $150,000, for National Drug & Chemical Co., 66 Princess street. Architects, Prack & Perrin, 36 James St. South, Hamilton, Ont. Five storeys, 100 x 100. Plans in progress.

Printing plant planned for Transcona Times. Architect, E. D. Tuttle, 701 McArthur Building. Two storeys and base[illegible] concrete foundation.

CONTRACTS AWARDED

Cayuga, Ont.

Business block, cost $10,000. Owner and builder, R. J. Hinds, Talbot street. Two storeys, white brick construction, stone and cement foundation. Excavating started.

Calgary, Alta.

Store and rooms, cost $5,000, 14th St. and 27th Ave. W., for F. Gascoyne, 14th St. and 27th Ave. W. Builder, J. A. Anderson, 2140 16th St. West. One sty., 28 x 40, cement foundation, frame construction.

Warehouse, cost $10,000, 6th Ave. East, for Max. Cohn. Builder, J. Harrison, Box 1243. Two storeys, 25 x 120, cement foundation, brick construction.

Factory, cost $4,000, Burnsland, for H. C. Richards, c/o Citadel Orn. Iron Works. Builders, Richards Bros. & Co., 409 5th Ave. West. One storey, 50 x 100, frame.

Edmonton, Alta.

Store and office, cost $15,000, Spruce, for E. S. McQuaid, Gariepy Block. Architect, P. Marvin, Jackson Block. General contractors, Bishop & Webster, 699 Namayo ave. Three storeys, 50 x 50, frame, cement and concrete foundation.

Alterations to bank, cost $6,000, Jasper Ave., for Bank of Montreal, Jasper ave., Edmonton. General contractors, McSporian & Co., 715 2nd St., Edmonton. Brick foundation and construction. To extend building. One storey 11 ft. x 23 ft., for lavatories.

Store and rooms, cost $5,000, Kinistino, for Gainers, Ltd., 8th street east, South Edmonton. General contractor and architect, Owner. Two storeys, 30 x 51, [illegible]

Stores and rooms, cost $3,500, Alberta. Architect and owner, G. Studdard, Gen. Del. General contractor, C. W. Morrow. Two storeys, 40 x 50, frame.

Garage, cost $15,000, Fraser. Architect and owner, Jas. Willman, 403 Tegler Blk. General contractors, Zenith Construction Co., 505 Agency Building. Two storeys, 33 x 100, brick.

Warehouse, cost $45,000, Kinistino. City Commisioners. Architect, A. Jeffers, Civic Offices. General contractor, O. J. Edinger, General Delivery, Edmonton. Three storeys, 63 x 73, brick and structural steel construction, cement and concrete foundation.

Ft. William, Ont.

Grain exchange, cost $280,000, Victoria, for Ft. William Commercial Chambers. Architects, Wirth, Carson & Smithley. Part of this building is to be in commission by September, so work will be rushed.. Five storeys, 100 x 125.

Car shop extension, cost $9,000, for C. P. R. Architect, Owner. General contractor, I. H. Simmons, Winnipeg.

Hamilton, Ont.

Addition to factory, cost $5,000, Barton East, for Malcolm, Souter Furniture Co., Barton East. Architects, Stewart & Witton, H. P. & L. Building. General contractors, Mitchell & Riddell, 91 Peter street.

Montreal, Que.

Three stores and six flats, cost $15,000, Fabre, for C. H. Bleau, 670 Demontigny East. Builder and mason, Chas. Bernier, 80 St. James. Carpentry, Prima Corbeil, 382 Fabre ave. Roofing, heating, plumbing, electric, J. E. Hardy, 666 Papineau. Three storeys, 68 x 45, concrete foundation, brick construction. Excavating started.

Store and 5 flats, cost $5,550, St. Dominique, for A. Duquette, 3136 St. Lawrence Blvd. General contractor, mason and carpenter, Owner. Three storeys, 47 x 49, brick. Owner will call tenders for heating and plumbing this week, roofing about 3 weeks and electric later.

Office building, Dom. Square, for Sun Life Assurance Co., 142 Notre Dame W. Architects, Darling & Pearson, 2 Leader Lane, Toronto. Excavation and foundation, John Quinlan & Co., 4412 St. Catherine.

Store, cost $20,000, for J. B. Drapeau, 915 St. Hubert. Builder and general contractor, D. Dupras, 420 Champlain. Brick Treffle Guilbeault, 914a Demontigny. Tenders received by General Contractor for concrete, painting, heating, plumbing, electric and roofing. Four storeys, 46 x 86, brick, cement foundation.

Stores and flats, cost $12,000, Melrose. General contractor, carpenter and builder, Chas. Fyfe, 137, Park Ave. Heating plumbing and electric, Staton & Bowell, 2554 Mance. Two storeys, 18 x 26, brick, concrete foundation.

Three stores and flats, cost $12,000, St. Catherine West & McGill, for Tannenbaum & Co., 111 Metcalf. Architect, C. J. Dufort, 632 St. Hubert. Builders, Picard & Valois, 1298 Bordeaux. Three storeys, 65 x 85, terra cotta construction.

Three stores and 8 flats, cost $9,000, Hadley, for Art Demers, 109 Hadley. Architect, R. Charbonneau, 15 St. James. General contractor, Owner. Three stys., 75 x 45, cement foundation, brick construction.

Office building, St. Urbain, for M. L. H. & P. Co., Power Building, Craig street. General contractors and foundation, P. Lyall & Sons, Construction Co., Ltd. Heating and plumbing, The Garth Co., 28 Craig W. 10 storeys, 95 x 91.

Store and flats, cost $15,000, Maisonneuve (Adam), for Louis Bois, corner Adam and Aird. Builder, A. Choquette, 170 Bourbonniere. Owner will receive tenders for plumbing, roofing and electric. Three storeys, 75 x 40, brick construction.

Store and flat, cost $10,000, St. Jerome, for J. G. G. Dufresne, 108 Garnier. Architect and builder, Owner. Three storeys, 75 x 45, brick construction.

Apartments, stores, etc., cost $750,000, St. Catherine East, for U. H. Dandurand, Cor. St. James and St. Lawrence. Architects, Ross & MacDonald, 1 Belmont. General contractor, C. E. Deakin, Sommer Building.

Foundry, cost $8,000, Maisonneuve (Ernest), for Sorel Iron Works, Ltd., Sorel, Que. Builder, Wm. Brown, 851 Marie Anne, Montreal. One storey, 60 x 100, cement foundation, brick construction.

Offices, cost $500,000, Beaver Hall Hill, for Guarantee Co. of North America, 57 Beaver Hall Hill. Architect, K. G. Rea, 54a Beaver Hall Hill. General contractors, Geo. A Fuller Co., 360 St. Catherine West. Ten storeys, 80 x 104, concrete foundation, brick and stone construction.

Montreal West, Que.

Store and residence, cost $9,000, Westminster, for Montreal West Realty & Construction Co., Westminster Ave. Architect, general contractor, mason and carpenter, Owner. Owner calling tenders for plumbing, heating and roofing. Electric tenders to be called later. Two storeys, 25 x 45.

Ottawa, Ont.

Storehouse, cost $25,000, Cooper, for Ottawa Dairy Co., Somerset street. Somerset street. Architect, J. Albert Ewart, 193 Sparks street. General contractor, 181 Waller. Solid brick construction.

Stores and apartments, cost $40,000, Bank, for F. X. Laderoute, 85 Bank St. Architect, E. Measter, Creighton Street School. General contractor, R. A. Kemp, 149 1st Ave. Three storeys, solid brick construction. Sub contracts not let.

Stores, cost $15,000, Sparks, for N. D. Porter, Bank street. General contractor, R. Holmes, 80 Arlington. Sub contracts not let. 48 ft. front, solid brick construction.

Redcliffe, Alta.

Factory for Hammond Stooker Co. General contractor, Lussier Construction Company, Medicine Hat, Alta. Work will start at once.

St. John, N.B.

Grain elevator, west, for C. P. R. Co., Montreal, Que. General manager, F. R. Hodge, Montreal. General contractors, J. S. Metcalf Co., Montreal, c/o J. K. Wyman, W. St. John, N.B. Metal windows and doors, Preston Metal Shingle & Siding Co., Preston, Ont.

Office and Warehouse alterations, South Wharf, for Smith Brokerage, Ltd., Pres., E. A. Smith, South Wharf. Builder and general contractor, D. L. McRoberts, 223 Pitt street. Mason, R. A. Corbett, Douglas Ave. Office fixtures only required. Two storeys, maple floors.

Stratford, Ont.

Factory for Farquharson-Gifford Co., Douro street. Architect, J. S. Russell, 21 Downie street. Mason, Jno. L. Young, 240 Birmingham street. Foundations in.

Sherbrooke, Que.

Hotel annex, cost $12,000, Bridge, for

Henri Desruisseau, East Sherbrooke House. Architect, J. W. Gregoire, 95 Wellington. General contractors, Sherbrooke Construction Company. Three storeys, 60 x 40. Foundations in.

Toronto, Ont.

Warehouse, cost $20,000, Queen W., for F. R. Cowan (in trust), 202 Crawford. Builder, T. Essery, Avenue Rd. Four storeys, 86 x 100, structural steel and brick construction, brick fndn.

Four attached stores and residences, cost $16,000, Bloor and Delaware. Owner and builder, J. L. Mitchell, 444 Markham street. Three storeys, 72 x 50, structural steel and brick construction, stone foundation.

One pair stores and residence, cost $6,000, for E. Lunan, 106 Don Mills. Architect and builder, J. Johnson, 51 Ellerbeck. Two storeys, 38 x 46, brick construction and foundation.

Dry kiln, cost $3,000, River, for Stewart Hartshorn, River street. Builder, D. A. Peacock, 577 Church street. One sty., 35 x 42, structural steel, reinforced concrete and brick construction.

Factory, cost $10,000, River, for Stewart Hartshorn, River street. Builder, D. A. Peacock, 577 Church street. One storey, 38 x 82, brick construction.

Truro, N.S.

Stores, cost $10,000, Prince street, for E. E. McNutt. Builder, general contractor, mason, carpenter, iron and steel and roofing, I. D. MacDonald, Box 231. Two storeys, 100 x 45, Sydney pressed brick construction.

Waterdown, Ont.

Store and residence for G. M. Reid. Mason and carpenter, Slater & Copp. Two storeys, 30 x 40, brick construction.

Windsor, Ont.

Bank and flats, cost $12,000, Wyandotte, for A. J. Campeau. Architects, G. Jacques & Co., Boug Building. Roofing, heating and plumbing, Jos. L'Heureux, 113 Goyeau street.

Winnipeg, Man.

Publishing plant, Smith street, for The Tribune Publishing Co., 211 McDermot Ave. Architect, J. D. Atchison, Trust & Loan Building, Portage Ave. E. General contractors, Hazelton & Walin, 303 Donalda Building. Three storeys.

Addition to office, cost $12,000, William and Ellen street, for Public School Board. Secretary, R. H. Smith. Architect, J. P. Mitchell. General contractors, Worswick Bros., 124 Hart Ave.

Store and residence, cost $4,000, Corydon Ave. Architect and builder, M. H. Kerr, 120 Adelaide street. One storey, 25 x 40, frame, stone foundation. Excavating started.

Residences

Calgary, Alta.

Residence, cost $4,000, Sunalta, for W. Graves, 702 Boulevard, N.W. Cement foundation, frame construction. Plans ready.

Residence, cost $4,000, Elbow Park. Architect and owner, O. Odland, 226 39th Ave. S.W. Two storeys, 34 x 40, cement foundation, frame and brick construction.

Edmonton, Alta.

Apartment, for Cown & Co., 234 Jasper Ave.W. Company have increased capital and will erect about 3 apartment houses this year. Plans prepared.

Apartment, 9th and McKay, for Twin City Realty Co., 130 Jasper West. Five storeys. Plans under way.

Residence, cost $14,500, 9th Ave. W., for H. A. Dickey, 678 21st. Architect, E. W. Moorehouse, Jackson Block. Two storeys, 34 x 38, cement foundation, frame and brick veneer construction. Plans ready.

Medicine Hat, Alta.

Huggines & Porter, Toronto street will erect 10 residences in block 9 Cousins and Sissons Sub. Division. Two storeys and basement. Cost $40,000.

15 residences under contemplation. Agent, W. H. Feeny, c/o F. M. Ginther Land Co., will supply all information. Work will commence at once.

Residence, cost $5,000, for H. C. Cooper, c/o Medicine Hat Ice Co. Architect, H. A. E. Browne, Becker Block. Two storeys, 9 rooms. Plans ready.

Montreal, Que.

16 flats, cost $64,000, Harvard Ave. Builder and owner, Jno. P. Severs, 164 St. James. Two storeys, 31 x 76, brick. Work will not start for some time.

Three flats, cost $7,000, Outremont (Hutchison), for D. Marcil, 2327a Esplanade. Three storeys, 25 x 75, white brick construction. Plans ready.

30 flats, cost $50,000, Outremont (Champagneur), for J. A. Prevost, 1455 Boul'd Gouin Ahuntsic. Three storeys, 21 ft. 6 in. x 70, brick. Plans prepared.

Four flats, cost $8,500, Harvard Ave., for Dr. N. Masse, 1336 St. Lawrence Blvd. Two storeys, 30 x 73. Plans being prepared.

Four flats, cost $8,500, Harvard Ave. Architect and owner, Dr. J. A. Cadot, 710 Logan. Two storeys, 30 x 73. Plans under way.

Nelson, B.C.

Residence, cost $5,000, for R. H. Ewart. Architect, W. Haldane, is preparing plans.

Ottawa, Ont.

Residence, cost $9,000, Clarey, for John Baird, 196 Mutchmore. 36 x 45, double brick construction, stone foundation. Plans in progress.

Residence, cost $8,000, Daly Ave., for Col. Sherwood, Daly Ave. Architect, C. J. Burritt, 193 Sparks street. Solid brick construction. Plans ready.

Residence, cost $6,500, Marlboro, for A. M. Dechene, Laurier Ave. E. Architect, C. J. Burritt, 193 Sparks street. Solid brick construction. Plans ready.

Residence, cost $10,000, Clemow, for H. B. Borbridge, 539 Gilmour. Architect, W. Herbert George, Castle Bldg., Queen street. Three storeys, cement and stone construction. Plans prepared.

[illegible] for J. Maloney, Coburg street. Architect, W. Herbert George, Castle Bldg., Queen St. Three storeys, solid brick construction. Plans prepared.

Toronto, Ont.

[illegible] Browning. Builder and owner, W. W. Hiltz, 682 Broadview Ave. 2½-storeys, [illegible] brick construction. Plans prepared.

Apartments, cost $9,000, St. Clarens, for H. W. MacDonald, Bloor and St. Clarens. Architect, J. A. Harvey, 164 Bay street. Three storeys, 34 x 40, structural steel and brick construction, brick foundation. Plans drawn.

Eight attached residences, cost $32,000, Pembroke, for A. E. McTaggert & Sons, Dovercourt road. Architect, N. G. Beggs, 12 Cosgrave Building. Two stys., 17 x 45, each, brick construction. Plans prepared.

One pair residences, cost $5,000, Gothic, for S. B. Green, Weston, Ont., Box 319. Architect, P. H. Finney, 79 Adelaide E. 2½-storeys, 36 x 40, brick construction. Plans drawn.

One pair residences, cost $6,000, Alberta, for Murray Watt, 31 Winchester St. Architect, A. E. Watson, 14 Leader Lane. 2½ storeys, 36 x 42, brick construction. Plans ready.

Vancouver, B.C.

Residence, cost $12,000, Shaughnessy Heights, for M. J. Gaskell, c/o of Gaskell Odlum, Ltd., 325 Hastings W. Architect, J. H. Peters, Metropolitan Bldg. Two storeys and basement, brick and cement construction. Plans drawn.

Windsor, Ont.

[illegible] Soper, Manning House. Architect, W. H. Jones, c/o Owner. 1½ and 2-storeys. Plans prepared.

Winnipeg, Man.

Residence, cost $12,000, Horne street, for T. L. Lidholm, 249 Aubrey. Architect, E. D. Tuttle, 701 McArthur Building. Project has been called off this season.

CONTRACTS AWARDED

Amherstburg, Ont.

Residences, cost $7,500, for F. P. Scratch, Amherstburg. Architects, G. Jacques & Co., Boug Bldg., Windsor. General contractor, J. D. Wilson, Amherstburg.

Burlington, Ont.

11 tenement houses, cost $8,000, for Dominion Canning Co. Local manager, Alex. Leitch. General contractor, Wm. Simons. Two storeys, 116 x 24.

Calgary, Alta.

Residence and garage, Mount Royal, for E. Coste, Managing Director Western [illegible] Natural Gas Co. Architect, [illegible] W. Gouinlock Temple Bldg., Toronto. General contractors, Rutty & Weare, 414 Underwood Block. Building is nearly completed. All contracts have been awarded.

Chicoutimi, Que.

Residence, cost $5,000, Tessier and Racine, for W. Francoeur. Architect and general contractor, L. J. Pedneault. 28 x 40, cement foundation, brick construction, sheet iron roofing. Excavating done.

Edmonton, Alta.

Residence, cost $1,300, Jasper East. Architect and owner, M. Hamilton, 131 Bellamy street. General contractor, N. McKenzie, 29 Stuart street, Edmonton. 1½-storeys, 24 x 28, cement concrete foundation, frame construction.

Residence, cost $7,500, Henry, for A. Kirkpatrick, Gen. Del., Edmonton. [illegible] storeys, 20 x 20, frame.

Residence, cost $7,000, 25th street.

(Continued on page [illegible])

Tenders and For Sale Department

Special Notice

[illegible] a tender must see your [illegible]. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract [illegible]

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works [illegible]

Send along your plans when asking for tenders put a line in your advertisement to that effect. No extra charge is made for filing plans at one or all four offices

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

THE PAS, MANITOBA

Sealed tenders, registered and endorsed on the envelope, Tender for (tender bidding on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the Town of The Pas, will be received up to 6 p.m., **July 1st, 1913**, for the supply of the following materials, and the performance of certain works:

Tender A

Supply and delivery of—
3770 ft. of 24-in. Vitrified Sewer Pipe.
5470 ft. of 20-in. Vitrified Sewer Pipe.
2000 ft. of 18-in. Vitrified Sewer Pipe.
600 ft. of 15-in. Vitrified Sewer Pipe.
1200 ft. of 6-in. Vitrified Sewer Pipe.

Excavating and laying and construction of Manholes, Catch Basins, Flush Tanks, etc.

Tender B

Trenching and laying of approximately—
4400 ft. of 12- in. steel pipe.
3500 ft. of 10-in. steel pipe.
4400 ft. of 8-in. steel pipe.
2000 ft. of 6-in. steel pipe.

Setting Valves, Hydrants, etc., and back filling.

Tender C

For the erection of Power House.

Tender D

For the erection of Pole Line.

Tender E

For the supply, delivery and erection of Motors, Pumps, Piping, and Air Compressor.

Tender F

For the supply and delivery of Poles, Wires, Line material, etc.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved surety company. The lowest or any tender not necessarily accepted.

The tender forms must be filled in—copies of which are attached to the specifications, or are obtainable at the office of the Consulting En- [illegible]

Plans and specifications may be seen at the office of the Consulting Engineers, The Canadian Engineer, 820 Union Bank Bldg., Winnipeg, and at the resident engineer's office, The Pas, Man., or a complete set of plans and specifications for any contract will be given or forwarded on a deposit of Twenty-five ($25) Dollars, and a set covering all contracts on a deposit of One Hundred ($100) Dollars, The deposit cheque will be returned if plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D.,
Secretary-Treasurer,
The Pas, Man.

MURPHY & UNDERWOOD,
Consulting Engineers,
23-26 Ross Block, Saskatoon, Sask.

First class firm required to take Sales Agency for large firm manufacturing all classes glazed and enamelled tiles, hand painted panels, etc. Write W. Godwin & Son, Limited, Withington, Hereford, England. 24-25

Intercepting Sewer Extension

CITY OF SASKATOON

Sealed tenders, addressed to the City Commissioners, Saskatoon, Sask., and endorsed "Tender for Intercepting Sewer," will be received until 12 o'clock noon, **Friday, June 20th, 1913**, for the construction, including all material and all labor, of the following work:

3,400 lineal feet of earth excavation and building 36-inch reinforced Concrete Pipe Sewer.

2,478 lineal feet of earth excavation and building 30 inch reinforced Concrete Pipe Sewer; also all necessary manholes and appurtenances.

Each proposal for work must be accompanied by a certified cheque for five per cent. of the contract price, payable to the order of the City of Saskatoon.

Plans, specifications, general conditions and forms of tender, may be seen at the office of George T. Clark, City Engineer, Saskatoon, or will be forwarded on receipt of a marked cheque for $15, which will be refunded if plans are returned with tender.

The lowest or any tender not necessarily accepted.

F. E. HARRISON, Mayor.
Chairman of Commissioners.

Saskatoon, May 30th, 1913. 24-25

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Sudbury, Ont.," will be received at this office until 4 p.m. on **Monday, June 23, 1913**, for the work mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto; at the Post-office, Sudbury, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 2, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—41813. 24-25

Department of Railways and Canals, Canada

Canadian Government Railways Halifax Ocean Terminals Railway, Halifax, N. S.

Sealed tenders addressed to the undersigned and endorser "Tender for Grading Halifax Harbour Terminals Railway" will be received at this office until twelve o'clock noon of the **21st day of June, 1913**, for the grading of a double track railway from Rockingham to the Halifax Ocean Terminals.

Plans, specifications and form of contract may be seen and full information obtained at the office of the General Manager of Government Railways, Moncton, N.B., at the office of the Engineer at Halifax, N.S., and at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, Ont.

The right is reserved to reject any or all tenders.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.

Department of Railways and Canals,
Ottawa, May 30th, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—42797. 24-25

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Shelburne, Ont.," will be received at this office until 4 p.m. on **Monday, June 30, 1913**, for the construction of a Public Building, at Shelburne, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of Mr. J. M. Vance, K.C., Shelburne, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, postal station "F," Cor. Yonge and Charles Sts., Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering declines to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 6, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—39676. 24-25

Orillia Water, Light and Power Commission

Water Works Extensions

Tenders will be received by the Chairman of the Commission up to June 30th, 1913, for the following works:—

Contract A.—Pipe laying.

Contract B.—Pump house.

Contract C.—Furnishing cast iron pipe and specials.

Contract D.—Furnishing gate valves and hydrants.

Contract E.—Pumping machinery.

Contract F.—Reinforced concrete receiving basin.

Contract G.—Furnishing 150 h.p. H. R. T. boiler.

Contract H.—Electrical equipment.

Plans and specifications will be on file at the Engineer's office, Orillia, and with the Canadian Engineer, Toronto, on and after June 18th, 1913.

The lowest or any tender not necessarily accepted.

E. LONG, Chairman.
W. K. GREENWOOD, Engineer.

25 26

Department of Railways and Canals, Canada

Welland Ship Canal

Section No. 1

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Section No. 1 Welland Ship Canal," will be received at this office until **16 o'clock on Thursday, July 17th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after June 4th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in charge, St. Catharines, Ontario.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of fifty dollars. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signatures, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $200,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into a contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as [illegible] fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
[illegible]

Department of Railways and Canals,
Ottawa, June 2, 1913.

[illegible] paid for it. 12993 25 26

Tenders Wanted

Tenders will be received by the undersigned up to six p.m., **June 21st**, for the building of a brick addition, consisting of four rooms, two halls and stairways to Georgetown Public School.

Lowest or any tender not necessarily accepted.

Plans and specifications may tbe had by applying to

JNO. A. THOMPSON,
Secretary P. S. Board,
25 Georgetown, Ont.

Province of Manitoba

TENDERS

Sealed tenders, marked "Tenders for New Parliament Buildings," will be received by the undersigned up to noon on **Wednesday, July 2,** for the construction and completion of the new Parliament Buildings, Winnipeg. Buildings to be completed and ready for occupation on or before first day of May, 1917.

Plans and specifications and forms of tender can be obtained on application to the Provincial Architect, 261 Fort street.

Tenders must be accompanied by a marked cheque for five per cent. (5 p.c.) of the amount of tender, which will be forfeited to the Government of Manitoba, in case the successful tenderer refuses or neglects to enter into a written contract, or, having done so, neglects or fails to carry out the provisions thereof.

The lowest or any tender not necessarily accepted.

G. R. COLDWELL,
Acting Minister of Public Works,

[illegible] 26, 1913 25 26

[illegible] and endorsed "Tender for Public Building, Preston, Ont.," will be received at this office until 4 p.m. on **Wednesday, July 2, 1913**, for the work mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, at the Post Office, Preston, Ont., and this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or [illegible]. If the tender be not accepted the cheque will be [illegible]

[illegible]

By order,

R. C. DESROCHERS,
[illegible]

Department of Public Works,
Ottawa, June 10, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from [illegible] 25 26

CITY OF REGINA, SASK.

TENDERS

Sealed tenders will be received by the City Commissioners at Regina, Sask., up until noon of **July 12th** for the supply of: Two vertical shaft, motor driven, centrifugal pumps to operate against 22 foot head, capacity 12,500 gallons per minute each.

Tender to be accompanied by a marked cheque [illegible] of tender.

Further particulars may be obtained from E. W. Bull, Superintendent of Light & Power Department, Regina, Sask. 25 26

Tenders for Turbine Pumping Machinery

Sealed tenders addressed to the Chairman, Board of Control, Winnipeg, and endorsed on the envelope as above will be received at the office of the undersigned up to 11 a.m. on Wednesday, **July 2nd, 1913**, for the manufacture, delivery and installation of two horizontal two-stage turbine pumps, direct coupled to a slow constant speed induction motor, switch gear and starter panel. Each pump to be capable of delivering 3,600 imperial gallons per minute, against a pressure of 150 pounds per square inch, or 1,800 imperial gallons per minute against a pressure of 300 pounds per square inch.

Plans, specifications and form of tender together with conditions governing tenders as prescribed by by-law, may be obtained at the office of the City Engineer, 223 James avenue, Winnipeg. The lowest or any tender not necessarily accepted.

M. PETERSON Secretary.

Board of Control Office,
Winnipeg, June 11th, 1913. 13

Sealed tenders addressed to the undersigned, and endorsed "Tender for Extension to Wharf at Sea Gull, Ont.," will be received at this office until 4 p.m. on **Monday, July 14, 1913**, for the construction of an extension to wharf at Sea Gull, on St. Joseph's Island, District of Algoma, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the office of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmasters at Sault Ste. Marie, Ont., and Sea Gull Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed [illegible] natures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an ac[illegible] the order of the Honourable the Minister of Public Works, equal to ten per cent (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
[illegible]

[illegible]
Ottawa, June 13, 1913

[illegible] ment if they insert it without authority from the Department 43487 25 26

Tenders for Bridge

[illegible] will be received by the undersigned up to 2 p.m. of **Saturday, the 28th inst.**, [illegible] 75 feet [illegible] Class "A" [illegible]

Further particulars on application.

[illegible]

[illegible], County Engineer,
Woodstock, Ont.

TENDERS

[illegible] will be received by W[illegible] Electric Light & Water [illegible], Ont., up to 2 p.m., **Saturday, June 28th**, for the construction of a concrete dam at the South Falls of the [illegible]

For plans and all information apply to the undersigned.

BOWMAN & CONNOR,
Civil Engineers,
[illegible] Street, Toronto, Ont.

Tenders for Bridge Construction

Sealed tenders, plainly marked as to contents, will be received by the undersigned up to noon of **Friday, June 27th, 1913**, for the construction of four bridges, B 13, B 15, B 16 and B 17, between the townships of Markham and Whitchurch in the County of York.

Plans and specifications and all necessary information may be seen at the office of the undersigned, 75 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
County Engineer.
Toronto, June 14, 1913. 25

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Elmira., Ont.," will be received until 4 p.m. on **Wednesday, July 2, 1913**, for the construction of a Public Building at Elmira, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained on application to the Postmaster at Elmira, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be [illegible]

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering declines to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept [illegible]

[illegible]

R. C. DESROCHERS,
Secretary.

[illegible]
Ottawa, June 9, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40373. 25-26

Sealed tenders addressed to the undersigned, and endorsed "Tender for Interior Fittings, Post Office, Port Arthur, Ont.," will be received until 4 p.m. on **Monday, June 30, 1913**, for the work mentioned.

Tenderers will not be considered unless made upon forms supplied by Department and in accordance with conditions contained therein.

Plans and specification to be seen on application to Mr. D. McKenzie, Caretaker, Port Arthur, Ont.; Mr. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, Ont., and at the Department of Public Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
—41433. Ottawa, June 12, 1913. 25-26

Board of Education

Sealed tenders, whole or separate, addressed to the Secretary-Treasurer of the Board, will be received until

Friday Noon, June 27th, 1913
for

Enlargement of the following Schools:

Deer Park, St. Clair Ave. East

McMurrick, Ossington Avenue

Howard, Howard Park Avenue

also for

Fireproof Floors

Balmy Beach School

Carlton School

Plastering

Lansdowne School

and for

Mid-Summer Repairs

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall not later than twelve o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

W. W. HODGSON
Acting Chairman of Committee.
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For Sale

1 Scow, 15 x 30 ft., nearly new.
1 Anchor, 400 lbs.
1 Anchor, 300 lbs.
3 Anchors, 200 lbs. each.
2 Sling Chains, 25 ft. long.
1 set Deferential Blocks complete.
1 pair of Shear legs.
1—12-in. Lead Pot (for melting).
1 Diaphram Pump (for drains).
1—5-in. Centrifugal Pump.
1 Tool Truck.
25 Drain Stays, 2 ft. 6 in.

Apply to McQuillan & Company,
1457 Queen Street West,
23-25 Toronto, Ont.

Piles For Sale

A carload of piles 30 to 40 ft. in length not needed on present. Will sell lot cheap.

BISHOP & BUCHANNAN,
24-27. Owen Sound, Ont.

For Sale

Complete Sewer and Water Contractor's outfit, including one Parsons Trench Excavator, trench braces, fire pots, pumps, etc. For price and terms, apply to Navin Bros., contractors, Moose Jaw, Sask. 13-T.F.

For Sale

Large deposit of a fine grained massive trap rock. Trap is of the very best quality for road work. Can be very cheaply quarried. Railroad runs right through the property. Freight rates reasonable. Apply S. A. Wookey, c/o British American Hotel, Kingston, Ont. 24-26

For Sale

One No. 1 Marsh-Capron Rail-Track Concrete Mixer, with Trucks, Steam Engine and Boiler, elevating Side-Loader and automatic Measuring Tank. Capacity, 9 cu. ft. of mixed concrete.

This is a first-class machine and has never been used. Will be sold at a bargain as the owner does not now require it.

Apply to Box 801, Contract Record, Toronto, Ont. 23-26

BARGAINS!

All Steel Drag Line, Lidgerwood, Class B. with 1½ yd. and 1 yd. buckets, 60 ft. boom; A.1.	$3,200
No. 0 Thew Steam Shovel, used less than 90 days, shop No. 690, practically new.	3,300
30 1½ yd. end dump cars, 36 in. gauge, practically new, each	30
1 American Well Works Air Compressor, 12 x 12 x 14, 340 ft. capacity, new ...	440
1 Rand Belted Compressor, 10 x 14, A.1.	240
1 Austin No. 0 Trenching Machine, used 1½ years thoroughly overhauled	2,700

THAT'S NOT ALL

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

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WANTED — A good general Architectural Draughtsman, steady position to the right man. Apply by letter stating salary expected, etc. Philip C. Palin, Architect, Collingwood, Ont. 24-25

WANTED—Architectural draughtsman, improver of few years experience, steady position, with experience to be gained in all branches of the work. Apply by letter, stating salary expected, etc. Philip C. Palin, architect, Collingwood, Ont. 25-26

DO YOU NEED HELP?

For construction work; Sewer, Bridge Work. We furnish skilled and unskilled labor for all kinds of work.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
Phone Ade. 3919. 24-25

Residences

(Continued from page 71)

Architect and owner, Jas. Gibbons, 25th street, Edmonton. General contractor, G. J. Thorpe, 38 Boyle street, Edmonton. Two storeys, 26 x 41, cement concrete foundation, brick construction.

Two residences, cost $7,000, Government street, for A. W. Thomas, Gen. Del. Edmonton. Architect and builder, Owner. Two storeys, 24 x 28, cement concrete foundation, frame construction.

Residence, cost $4,800, 19th street, for N. Brown, 774 6th Ave. N.W., South Edmonton. General contractor and architect, Owner. 2½-storeys, 27 x 26, frame.

Residence, cost $4,500, 25th, for C. W. Coppock, 1377 25th street. Architect, A. Cowley, Gen. Del., Edmonton. General contractor, Marshall Hughes, 9th street. Two storeys, 30 x 33, frame.

Residence, cost $4,000, 25th street, for Samuel Hartford, Kirkness street. Architect and general contractor, J. L. Arnelt, 170 Kennedy street. Two storeys, 26 x 30 frame.

Edmonton South, Alta.

Residence, cost $5,000, 3rd ave. N., for Mr. Stacey & Mr. Dougall, P.O. Box 4821. Architect and general contractor, Owner. Two storeys, 26 x 30, frame.

Residence, cost, $5,000, Whyte Ave., for Horace A. Dickey, Jasper Ave., N. Edmonton. General contractors and architects, Prov. Construction Co., 634a 1st St., N. Edmonton. Two storeys, 36 x 32, frame.

Hamilton, Ont.

Residence, cost $8,000, Westmoreland, for Chas. H. Hartmann, 59-61 McNab St. N. Architects, Mills & Hutton, Bank of Hamilton Building. Mason, J. R. Isbister, 125 Wellington St. S. Carpenter, Carpenter, R. A. Campbell, 117 Duke St. Electrical, Culley & Breay, King St. W. Plasterer, Hill Bros., 307 Emerald St. N. 2½-stys., 37 x 25.

Residences, cost $15,000, Inglewood. General contractor and owner, W. A. Noble, 80 George street.

Residence, cost $7,000, Homewood ave., for L. S. Turner, c/o Architects. Architects, McPhie, Kelly & Darling, Bank of Hamilton Building. General contractor, H. C. Gummo, 15 Tuckett street. Brick construction.

Residence and garage, cost $8,000, Delaware Ave., for C. H. Hartmann, 59 McNab St. N. Architects, Mills & Hutton, Bank of Hamilton Building. General contractor, Robt. Isbister, 125 Wellington street. Brick construction.

Residence, cost $6,000, Main St. E. Architect and general contractor, F. A. Havers, 50 Dunsmore Ave. Foundations in.

Residence, cost $5,000, Delaware Ave., for F. C. Ford, Caroline St. S. Architect, E. B. Patterson, 167½ King street South. General contractor, S. C. Troubridge, Stanley Ave. Brick construction.

Montreal, Que.

Four flats, cost $11,000, Harvard Ave., for Jno. P. Sovers, 164, St. James. Builder and architect, Owner. Two storeys, 31 x 76, brick, concrete. Work will not start for some time.

Four flats, cost $16,500, Harvard ave. Builder and owner, J. P. Sovers, 164 St. James. Work will not start for some time. Two storeys, 31 x 76.

Six flats, cost $6,000, Beaudry. General contractors, mason and carpenter, J. A. Lambert & Bros., 324 Prefontaine. Three storeys, 36 x 60, brick, concrete foundation. Other tenders called this week.

Six flats, cost $6,500, for Jos. Leclair, 786 DeGaspe. Builders, Dagenais & Freres, 1917 Clark. Three storeys, 26 x 50, felt and gravel roofing.

Six flats, cost $5,500. Owner and builder, R. Lamonieux, 483 Hochelaga. Three storeys, 45 x 35, brick, concrete foundation.

Six flats, cost $10,000, Outremont (Champagneur). Builder and owner, A. Lafleur, 2665 Hutchison. Three storeys, 20 x 70, stone foundation, brick construction.

Residence, cost $18,000, Westmount (Redfern Ave.), for Mrs. J. Cunningham, Arlington Ave. Builder, G. Roberts, 79 Lagauchetiere St. W. Mason and brick, Gray & Wighton, 244 Pine Ave. W. Roofing, Richardson, Simard & Co., 745 Clarke street. Heating and plumbing, Staton & Bowell, 2554 Mance street. Plastering, Knott & Co., Chestnut Ave. Other contracts not yet awarded Three storeys and basement, 25 x 60, brick.

Eight flats, cost $8,500, Des Erables. Builders and owners, Pickleman & Seguin, 510 Chambord. Three storeys, 50 x 50.

Five flats, cost $6,000, Cadieux, for L. H. Bernard, 764 Cadieux. Architect, Art Lanis, 83 St. Gabriel. Builder, H. L. Desaulniers, 1072 Sherbrooke E. Roofing, heating, plumbing and electric, Jos. Belisle & Frere, 808 Papineau. Painting, Owner. Two storeys, 35 x 20.

Flats, cost $5,000, Verdun (Evelyn). Builder and owner, Geo, Ranger, Victoria street, St. Lambert. Three storeys, 32 x 40, brick construction.

Residences, cost $28,000, Outremont. Owner and builder, C. Desjardins, 454 Durocher ave. Two storeys, 22 ft. 6 in. x 38, pressed brick construction, stone foundation, felt and gravel roofing.

Toronto, Ont.

Five pair residences, cost $25,000, Dixon. General contractors and builders, Grimshaw Bros., 24 Brookmount. 2-storeys, 34 x 42, brick construction and foundation.

Two pair residences, cost $10,000, Ossington. Owners and builders, Ausman & Marshall, 507 Davenport. 2½ stys., 32 x 42, brick construction and foundation.

Three detached residences, cost $9,000, Rosedale Drive, for H. H. Davison, and J. McKibbin, 184 Indian Road. Architect and builder, H. J. Maughan, 48 Quebec. 2½ storeys, 24 x 34, brick construction.

Residence, cost $5,000, Nina. Builder and owner, A. J. Peppiatt, 81 Hilton. Two storeys, 24 x 40, brick construction.

Winnipeg, Man.

Two residences, cost $[illegible], Mathe[illegible] ave. Architect and builder, L. Pullner, [illegible] Alfred ave. Two storeys, 20 x [illegible], frame, stone foundation.

Residence, cost $20,000, Wolseley and Kenora, for Mr. Morsey, care architect, P. M. Clemens, 331 Garry street. General contractors, Willoughby & Kelso, 958 Main street. 2½ storeys, 33 x 49, pressed brick construction, stone fndn

Power Plants, Electricity and Telephones

Bridgeburg, Ont.

Telephone exchange, cost $3,000, Central ave., for Welland County Telephone Co., Ltd. Carpenter, C. W. Taylor. Plumbing, J. D. Smith. Two storeys, 22 x 40.

Chatham, Ont.

Power station planned for Ontario Hydro Electric Power Commission, Bay and Richmond streets, Toronto.

Dundas, Ont.

Power station for Ontario Hydro Electric Power Commission, Bay and Richmond streets, Toronto. One storey, 40 ft. long, brick and steel construction, cement floors. Plans in progress.

Fleet Springs, Sask.

Fleet Springs Telephone Company has been incorporated and system is to be installed, cost $22,000. All material except poles required. Secretary, R. R. Ambler, Norwich.

Windsor, Ont.

Power station for Ontario Hydro Electric Power Commission, Bay and Richmond streets, Toronto. Plans ready.

London, Ont.

Power station for Ontario Hydro Electric Power Commission, Bay and Richmond streets, Toronto. 40 feet long. Plans in progress.

Niagara Falls, Ont.

Power station planned for Ontario Hydro Electric Power Commission, Bay and Richmond streets, Toronto. 180 feet long.

St. Thomas, Ont.

Power station for Ontario Hydro Electric Power Commission, Bay and Richmond streets, Toronto. 40 ft. long. Plans in progress.

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The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

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Four cottages to rent $125 to $250 on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box [illegible]

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Our work on many notable Canadian buildings is a guarantee of our ability to successfully carry out the most important contracts.

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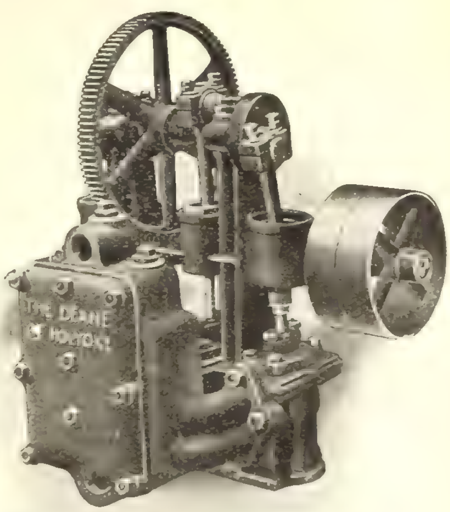

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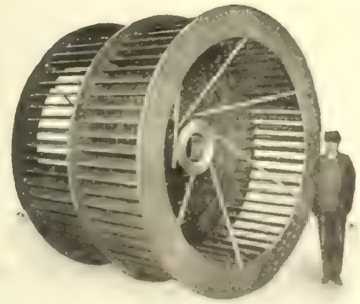
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.



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Low cost of Installation, low cost of Operation, low cost of Maintenance, and High Efficiency are the deciding features of "Sirocco."

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Aside from our own Expert Engineers we have at our command the co-operation of the Engineering Service Department of the American Blower Company, and the results of years' of experience of S. C. Davidson, the inventor, Belfast, Ireland.

A "Sirocco" Fan will deliver more air with less power than the ordinary steel plate fan **twice** the size.
"Sirocco" Fans and Blowers are used in connection with apparatus for Heating, Ventilating and Cooling, in Industrial, Educational, Office and Public Buildings.
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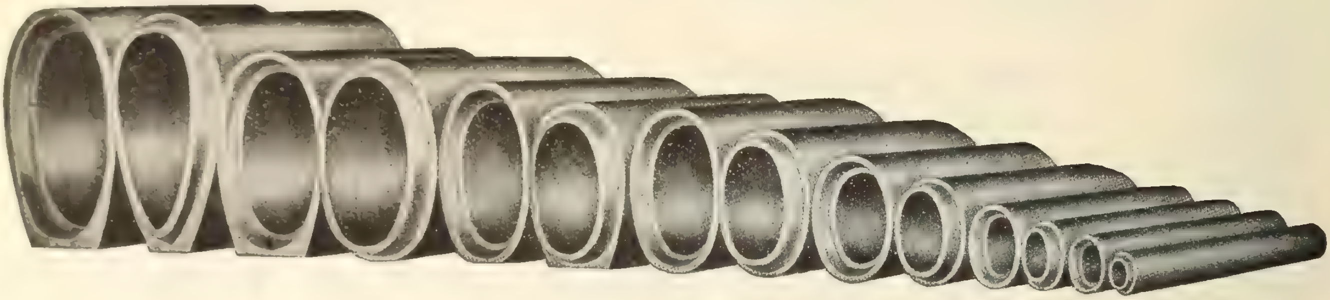

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OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

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EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited

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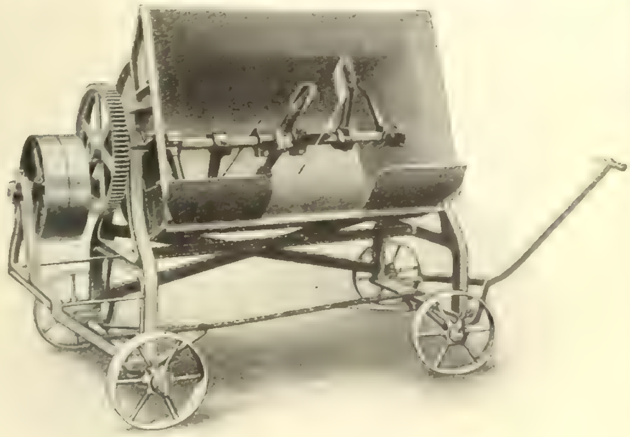

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For combination shop and outside use this Hand Truck Mixer is acknowledged to be the very best on the market. It has been used on hundreds of sidewalks and foundation contracts with unqualified success. It is strongly built and so simple in design that it will never give any trouble with repairs.

Strongly Made—Well Balanced **Easy to fill—Easy to Dump**

Send for Catalogue

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
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"Eastlake"
Steel Shingles

There is a great and growing demand for "Eastlake" Steel Shingles, because they make fire-proof, lightning-proof and weather-proof roofs that are very low in cost and will give longer service than any other roof yet produced.

These shingles have many strong points found in no others. Why not write to us for catalog R 2 and prices? It will pay you.

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Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

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1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

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1—10 x 16 Standard Gauge Porter Locomotive
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1—6 1-2 x 8 American D.C. D.D. Hoist with Swinger
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1—5—Ton Tandem Roller
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5 Rock Drills
1 No. 2 Smith Concrete Mixer
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The above machines are but slightly used and are in good working order.

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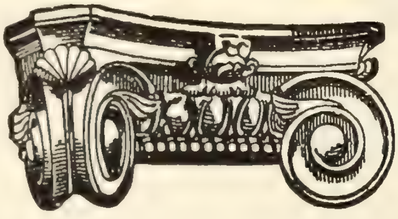

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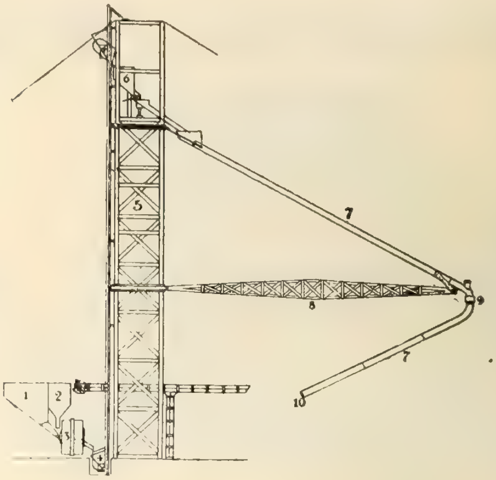

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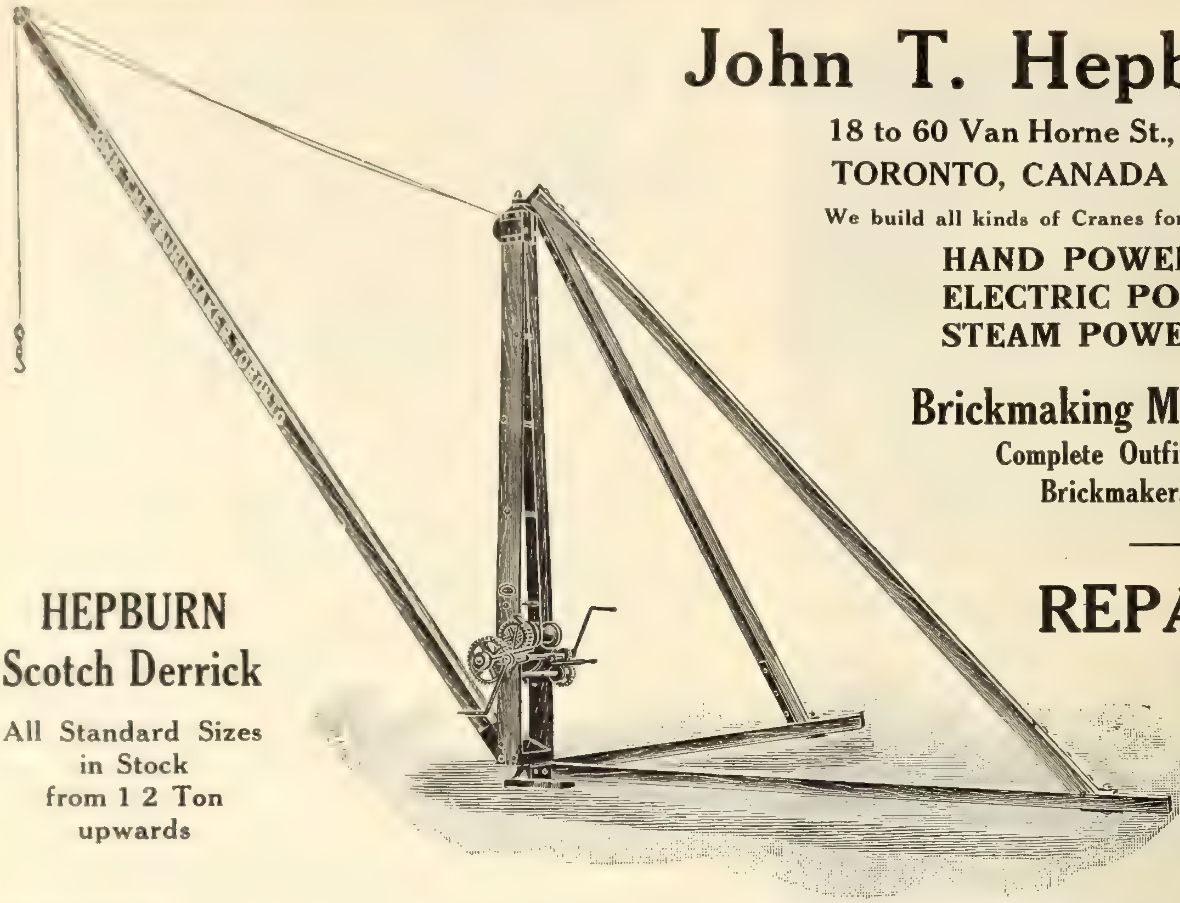

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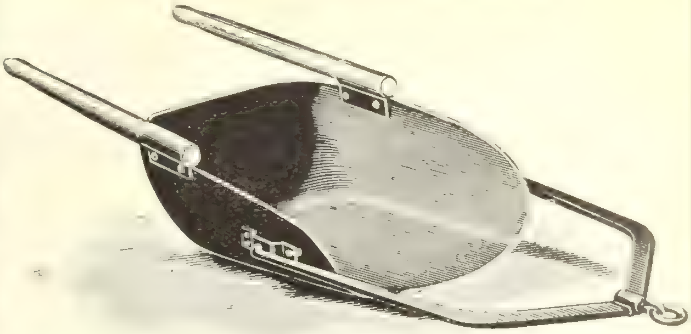

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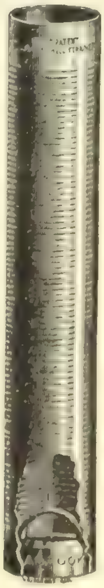

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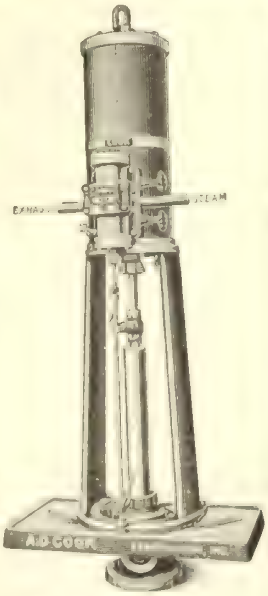

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Get Maximum Efficiency From Your Concrete Reinforcing

When the concrete is compressed in several directions, the compression in one direction tends to of-fsett that in another. This fact permits the use of a minimum amount of concrete with high efficiency in the steel in the mushroom system

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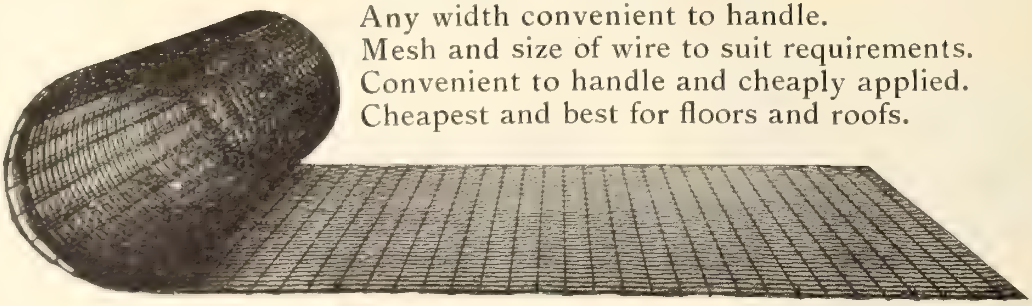

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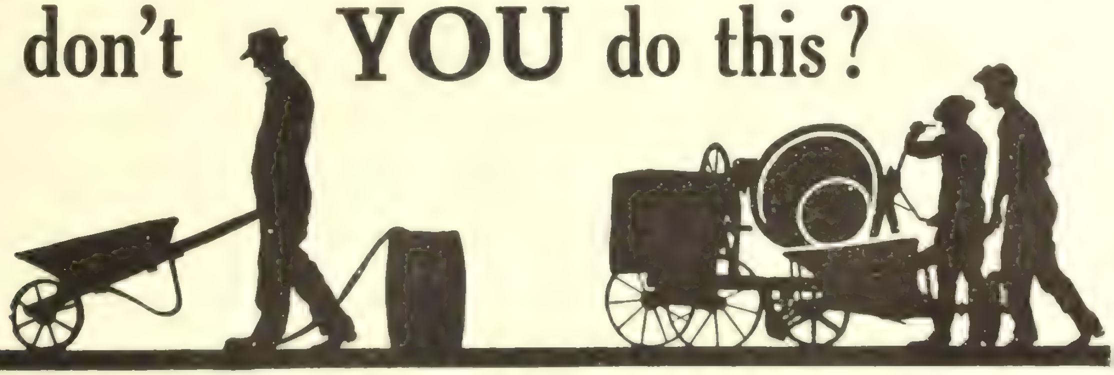

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My LITTLE WONDER "FIVE" paid for itself in just one month. I have worked around several different mixers and the LITTLE WONDER "FIVE" has them all beaten.

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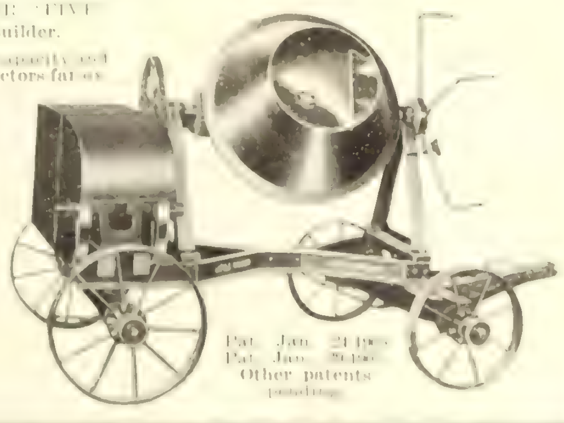
"The Small Job Money-Maker"



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and our "Man to Man" proposition for payments make this the best "buy" ever known in mixers for small work. Thousands of contractors in the States are doubling their profits with it—why not you?

If you want a machine for heavy work look into our WONDER "TEN" capacity 10 cu. ft., or 1/3 yd. "Sack to the batch." Same FREE TRIAL, same liberal terms.

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The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

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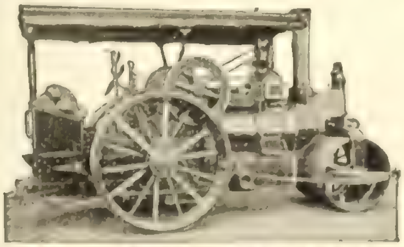

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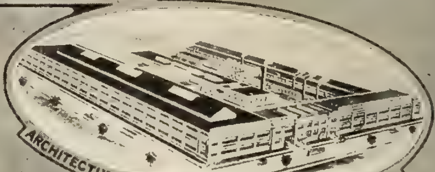

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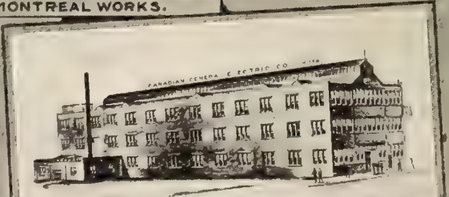

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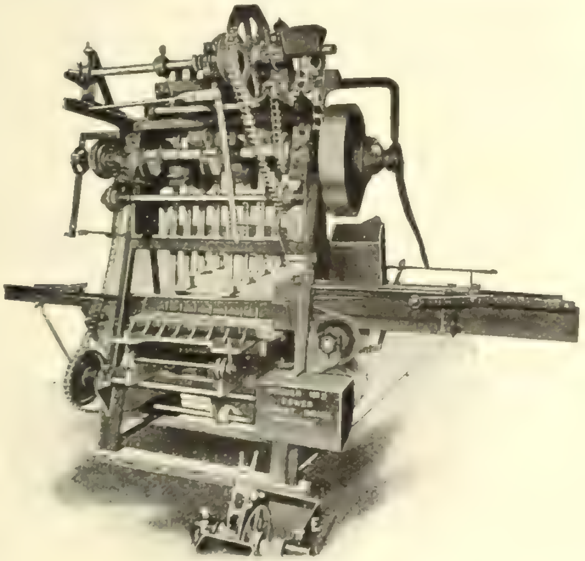

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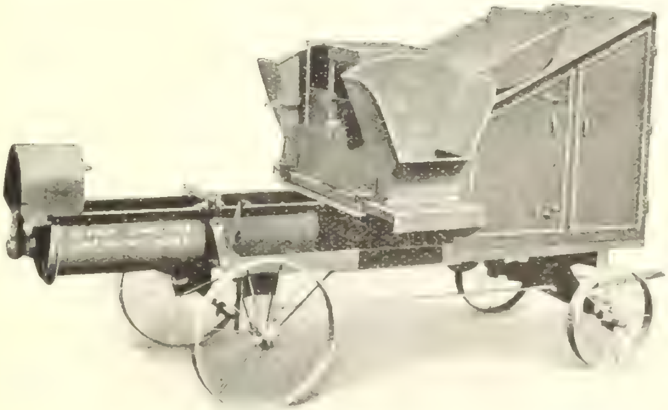

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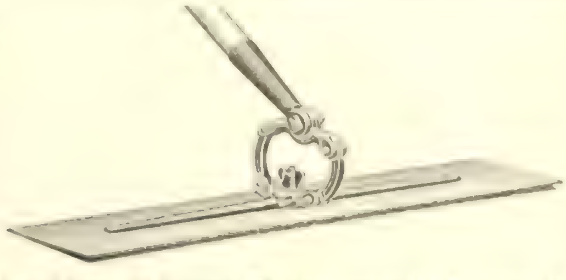

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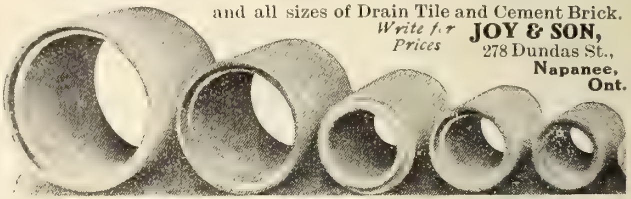

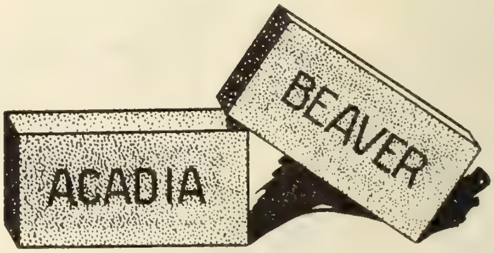

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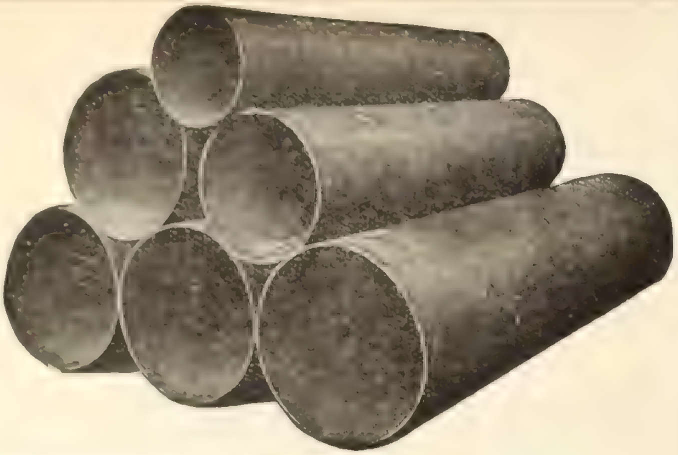

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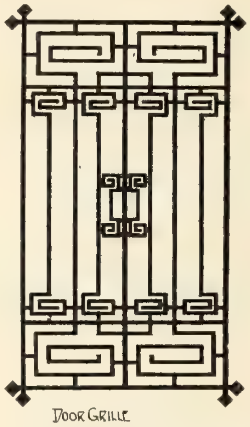

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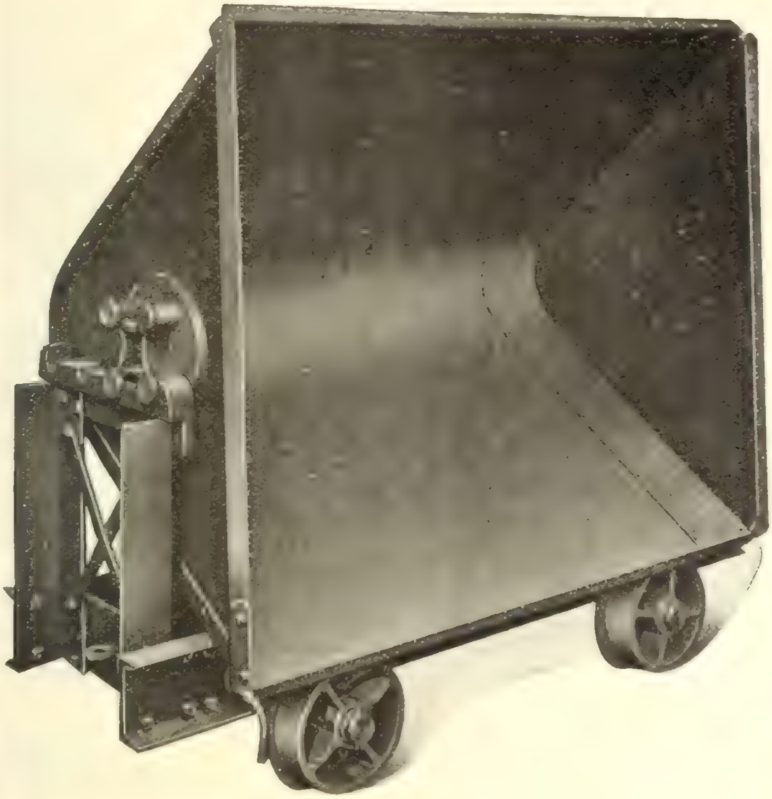

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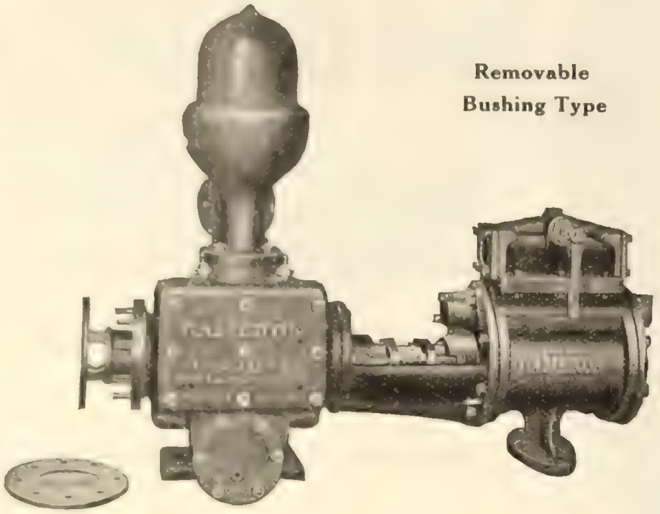

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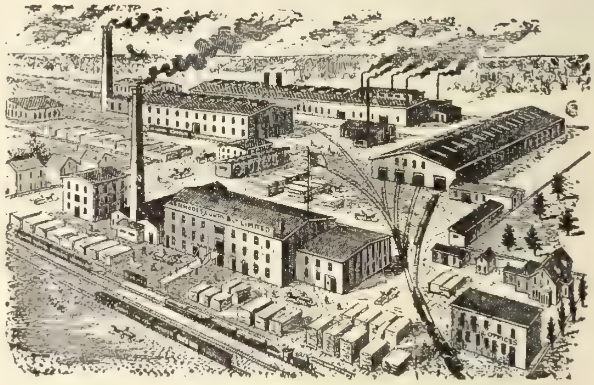

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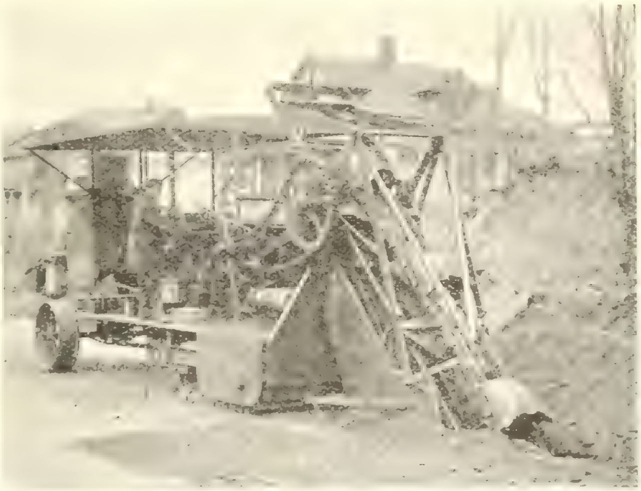

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Working an Eight Hour Day
A Two-Hour Tie Up = 25% Less
Trench Dug + a Repair Bill.

Digging Speed is an Essential in a trench excavator but it can exist only where there is no loss of digging time.

Loss of Digging Time results from several causes: (1) Complicated power transmission; (2) compound excavator arm; (3) skidding and slipping traction; (4) clogging elevator buckets; (5) track building over soft spots; (6) breakages due to poor materials.

An Austin Trench Excavator does not lose digging time because: (1) It has single chain drive; (2) it has a single hinge straight beam excavator arm; (3) it has multipedal tractions which cannot slip or skid like wheel tractions; (4) it has positively self-cleaning buckets; (5) its multipedal tractions carry the machine over soft ground without planking; (6) its construction is all steel with manganese steel wearing and working parts.

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3 inches to 60 inches diameter

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Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

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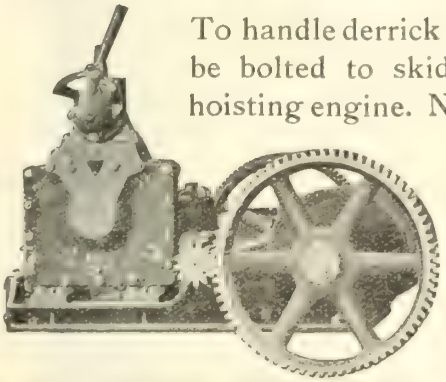

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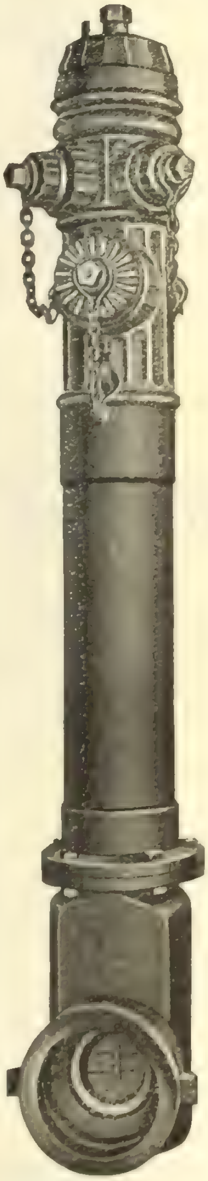

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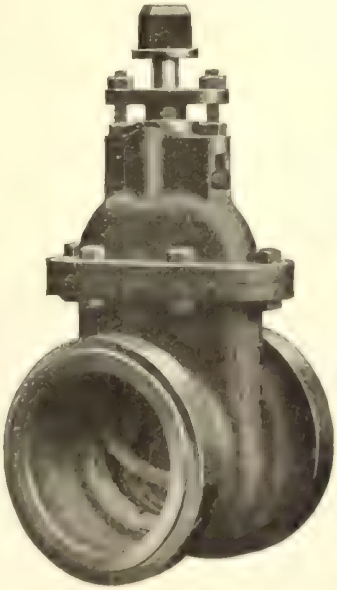

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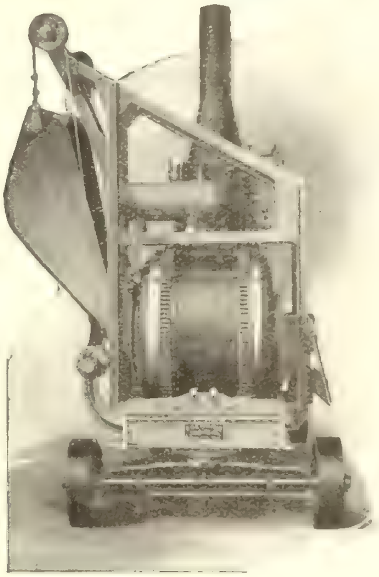

We know that concrete mixers get hard service—and so we build THE KOEHRING to *stand* hard service.

We do it by putting the right kind of material into every part of THE KOEHRING—and *enough* material.

Its truck, for instance, is very rugged; it is made with a full 100% safety factor of strength.

Then there are features of design that add greatly to its lasting qualities.

For instance the rollers in THE KOEHRING are keyed onto the shaft *exactly as in a railroad truck*, preventing rapid wear of trunnion rollers and runaways and disalignment of drum, the cause of so many mixer troubles.

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Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto.

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
[illegible]	13 00
[illegible]	13 00
[illegible]	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No 2 Hemlock dimension and 1-in.	20 00	22 00

[illegible]

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving	36 00	42 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

[illegible]

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
[illegible]	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock	net $1.85
No. 4½ Fuller's	net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

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Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

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Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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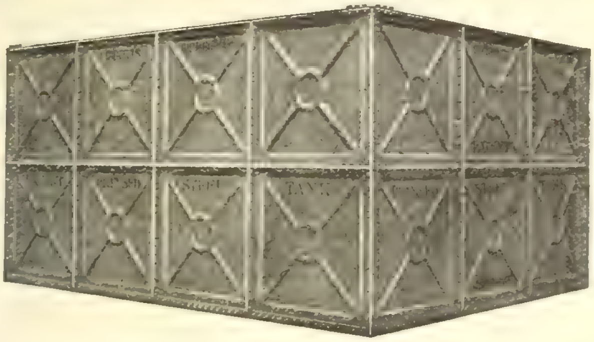
Bank of Ottawa Bld'g, 224 St. James St. **Montreal**
Bell Tel. M. 4354

Canada Lumberman & Wood Worker

Toronto, Canada



Made in any length or width in multiples of 4-ft. by 8-ft. or 12-ft. deep.

Patent Pressed Steel Tanks

are built up of plates 4 ft. square by 5/16th in. thick. There are only three types of plates and all are interchangeable. Easily erected by unskilled labor.

LIGHT. STRONG. CHEAP. UNBREAKABLE.

IMMEDIATE DELIVERY FROM STOCK.

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of any diameter over 12 inches and having any desired type of joint.

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Dominion Ornamental Iron Co., Limited

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Stairways in Wrought and Cast Iron
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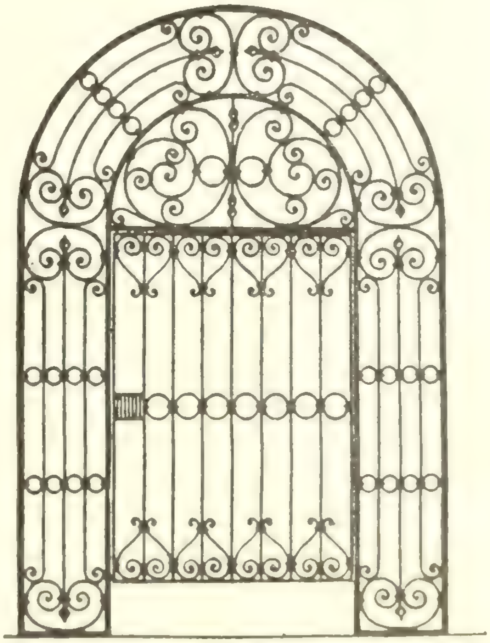
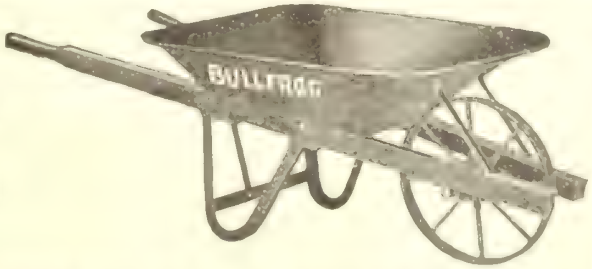


"Bull Frog" Wheelbarrows and Concrete Carts of all descriptions



Are you satisfied with your wheelbarrows, if not you can purchase the "Bull Frog" brand from Dominion Equipment & Supply Co. of Winnipeg, London Concrete Machinery Co., Ltd., London, Ont. and E. P. Jamison & Co., Ltd., of Vancouver, and be assured of satisfaction.

THE TOLEDO WHEELBARROW COMPANY, TOLEDO, O., U.S.A.

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SMYTH & RYAN

for quotations on

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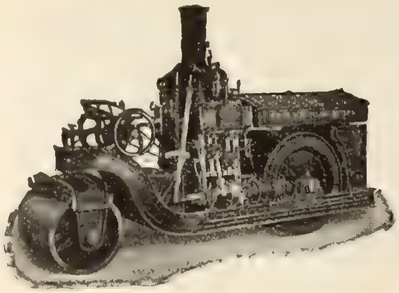

"Our 20th Century Roller"

Send for our Catalogue of Asphalt Rollers and Mixers.

1303 PEACH STREET - ERIE, PA.

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MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited

Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.

428 Transportation Bldg., MONTREAL

Do You Think

that you can Afford

to pass us by before getting our prices on your requirements or before putting in your tenders on

Plate Sheet Fancy

or any kind of

Glazing Glass

The
Consolidated Plate Glass Co.
of Canada, Limited

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NOW is the time to renew your

SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

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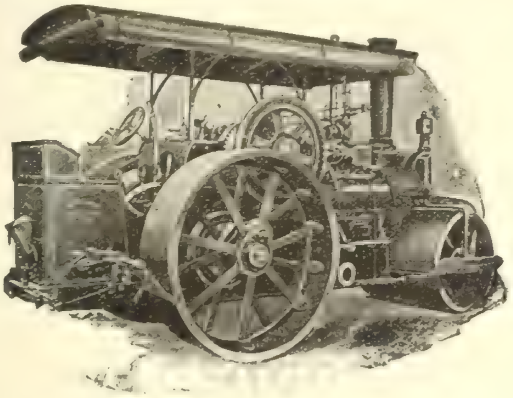
"IECO" BRAND OF REFRACTORY FIRE CLAY MATERIALS

Western Lumberman
Representing the Lumbering and Woodworking interests of British Columbia Alberta Saskatchewan and Manitoba

Winnipeg, Man.

Saving Costs In Road Building—

Road building is mainly a matter of labor. With $5.00 a day being paid for teams and $2.00 a day for men, the one way to cut down road making costs is to employ machinery to do the work wherever possible. The more continuously this machinery can be kept at work the greater the economy effected.



The

Waterous Roller

is the one all-round road builder. It can be used to haul road plow, scarifier, or grader. It will pick up the old road-bed or pavement. Without change or extra expense it will easily replace six teams to haul wagon train long distances at a great saving over team or traction engine work. It will drive rock crusher or stone screen when other work is at a standstill. On one or other of these operations with the work properly laid out it can be kept busy all the year round.

Further, the Waterous Roller is driven by steam, the oldest, simplest and most reliable of motive powers. It carries a double cylinder, double crank engine, large capacity locomotive boiler, steel cut gears, locomotive link valve motion, all special features that mean ease and simplicity of control and economy in operation. Every part is designed and built to stay right and it does. Waterous Rollers sold nineteen years ago are still doing first class work.

Because it can be used in every operation in road building, because it can be employed every working day in the year, and because it is constructed to be "on the job" whenever wanted, the Waterous Roller is the most economical road maker that can be bought.

Over 150 satisfied users—among them the largest municipalities and leading contractors in Canada—are the best proofs we can offer to back our claims.

Bulletin and List of Rollers Sold—on Request

The Waterous Engine Works Co.
Limited
Brantford, Canada

TUEC CLEANED

The Rex Theatre at Calgary, Alta., cleaned daily by

TUEC

Stationary Air-Cleaning System

CANADIAN TUEC DISTRIBUTORS
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Canadian Factory—B. O. T Building, 159-61 Richmond St. W., Toronto—Jas. J. Martindale

"Buffalo"

**Punches
Shears
and Drills**

Among our recent designs is the Bar Cutter No. 10 for cutting concrete reinforced bars—twisted, round or any other shape. It cuts bars up to 1½" thick and, due to its steel frame, its **weight is only half** that of a cast iron machine of the same capacity. Ask for catalog of Steel Punches, Shears and Drills No. 145.

Canadian Buffalo Forge Co.
MONTREAL Limited
St. John
Toronto
Winnipeg
Vancouver

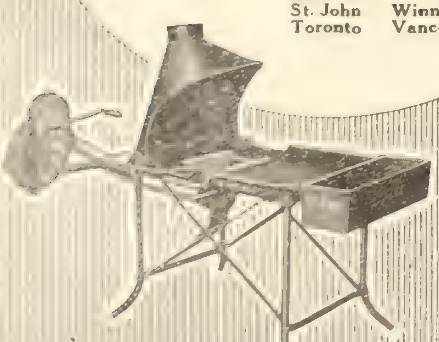
"Buffalo"

Forges

"Built to Last"

is the slogan of our **1912 Rivet Forge.** The repair cost by this design is guaranteed to be actually **cut in two,** compared with any other forge now in the market. A bridge company using a large number of forges writes us regarding it: "The operator claims it runs easier and heats more rivets in less time than any forg he has ever used." Let us send you one on free trial. Fifty other styles, for light and heavy work.

Canadian Buffalo Forge Co.
Limited
Montreal
St. John
Toronto
Winnipeg
Vancouver



Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

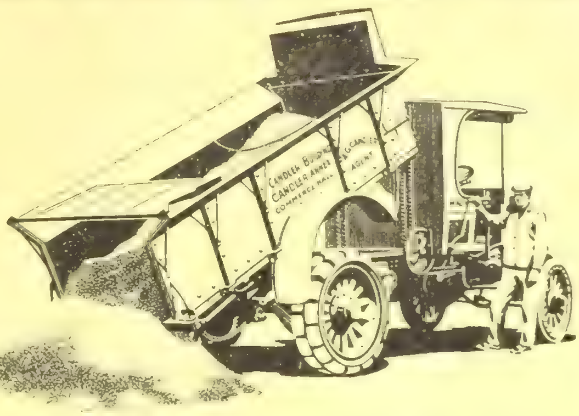
"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

MACK

A Mack Truck That Replaced Five Double-Teams In Winnipeg



The five-ton Mack Dumping Truck shown here is owned by the Lake Winnipeg Shipping Company, Limited, and it has replaced five double teams, the service of which teams would cost approximately $30.00 per day. This truck is engaged in hauling gravel, sand and rubble from the docks to various points throughout the city. The heavy mud which forms on the unpaved roads after rainfalls does not interfere with its operation.

We have records of hundreds of five-ton Mack Trucks that are earning from $30.00 to $50.00 per day.

Mack Trucks have proven their reliability, economy and long life by 12 years of real service in every line of transportation.

You should investigate the Mack before buying a truck. Ask us to show you.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

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ADANAC RED CORE RUBBER COVERED WIRES AND CABLES

Are made according to the specifications of the National Board of Fire Underwriters. The conductors are drawn from copper of the highest conductivity and are covered with two thicknesses of thoroughly vulcanized rubber compound of high quality. The wires are braided over insulation and the smooth high finish they receive makes them specially desirable for conduit work.

IMPERIAL WIRE AND CABLE COMPANY
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The Northern Electric and Manufacturing Co. Limited
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TORONTO REGINA WINNIPEG
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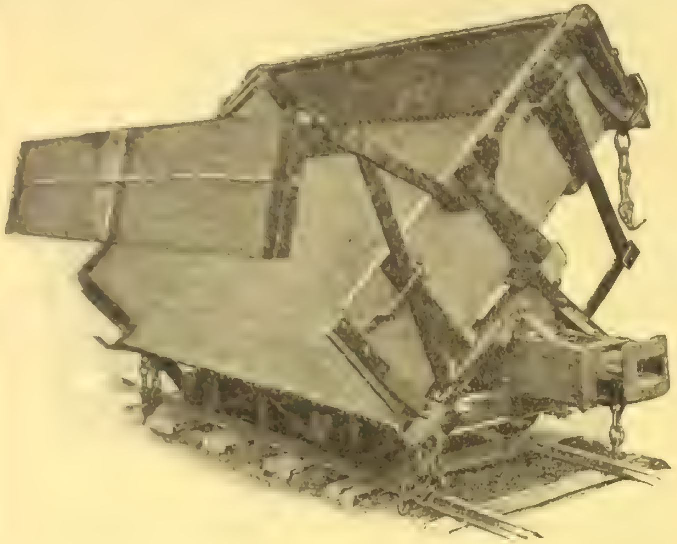

"KILBOURNE & JACOBS"

Dump Cars

Our Dump Cars will give you entire satisfaction. We can supply cars in all capacities for any practical gauge. Wheels are all properly chilled and the construction and material used are the best.
Our Cars are declared by steam shovel and car men to be superior to all others, both in construction and operation.

Let us have your enquiry, we would be pleased to submit full particulars and prices at any time.

"Davenport" Saddle Tank Locomotives

For Contractors and Quarry Service

Supplied in any size for any practical gauge track.

"Marion" Steam Shovels

For Railroads — Contractors — Brickyards, Etc.

We supply Steam Shovels in all sizes. Can furnish both Standard and Revolving types. Write us stating your special requirements and we will be pleased to submit proposition.

F. H. Hopkins & Co.

MONTREAL

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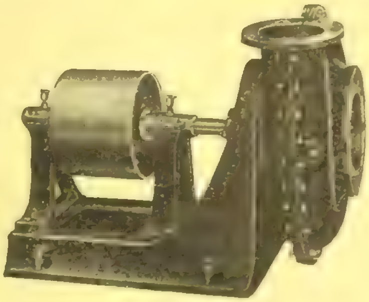
Vol. 27 Toronto, June 25, 1913 No. 26

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps
Condensers, Travelling Cranes



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HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND
SHEET
PILE DRIVERS
—Prove the Value of Experience.
—Utilize all the Energy.
—Have Standard Mechanism.
—Are Handled with Facility.

Send for [illegible]

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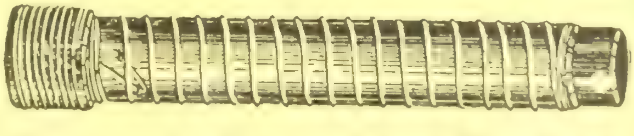
Ingersoll-Rand
Co., Limited
MONTREAL, CAN.



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RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
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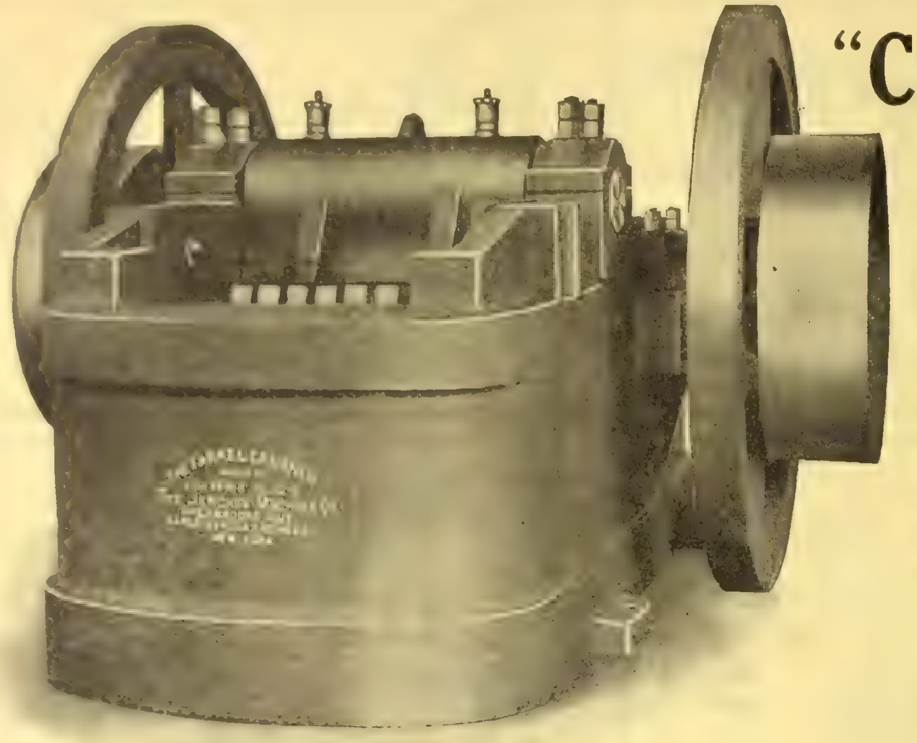
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



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Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

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"AMERICAN" DERRICK ENGINE

CROWD IT

RUSH IT—JAM IT

UP WITH WORK—THERE'S NO DANGER

OF THE

"AMERICAN" Hoisting Engine

"LAYING DOWN"

IT STANDS FIRM UNDER THE HARDEST DUTY

IT PULLS TO THE LIMIT

IT'S THE ENGINE WITH THE PERFECT FRICTION

If you need EXPERT ADVICE regarding Hoisting Engines, write us

American Hoist & Derrick Co.

ST. PAUL, MINN., U. S. A.

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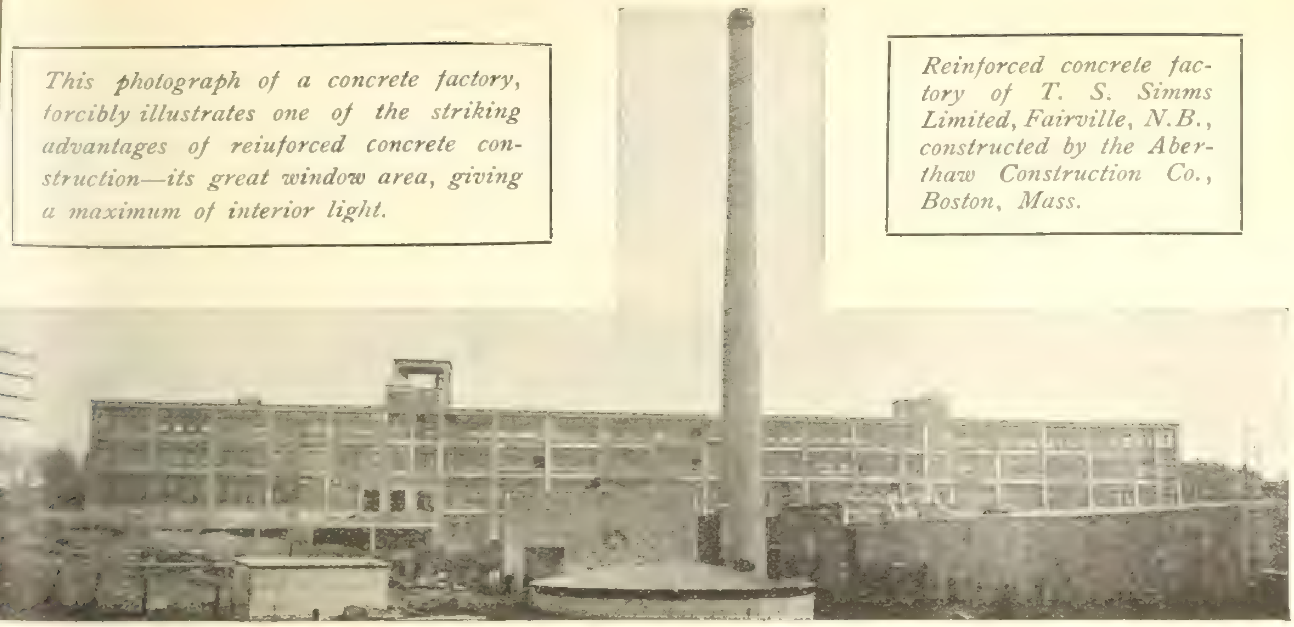
Stuart Machinery Co.—Winnipeg, Man.
General Supply Co. of Canada, Ltd.—Montreal, Ottawa, Toronto, Canada.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company

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Montreal

Working All the Time

That's why

Smith

Concrete

Mixers

are the Money-Makers.

You are not bothered with breakdowns or delays for repairs, because the SMITH is BUILT RIGHT from the start.

Made in Montreal - Quick Shipments

Montreal, 318 St. James St.
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Winnipeg, 259-261 Stanley St.

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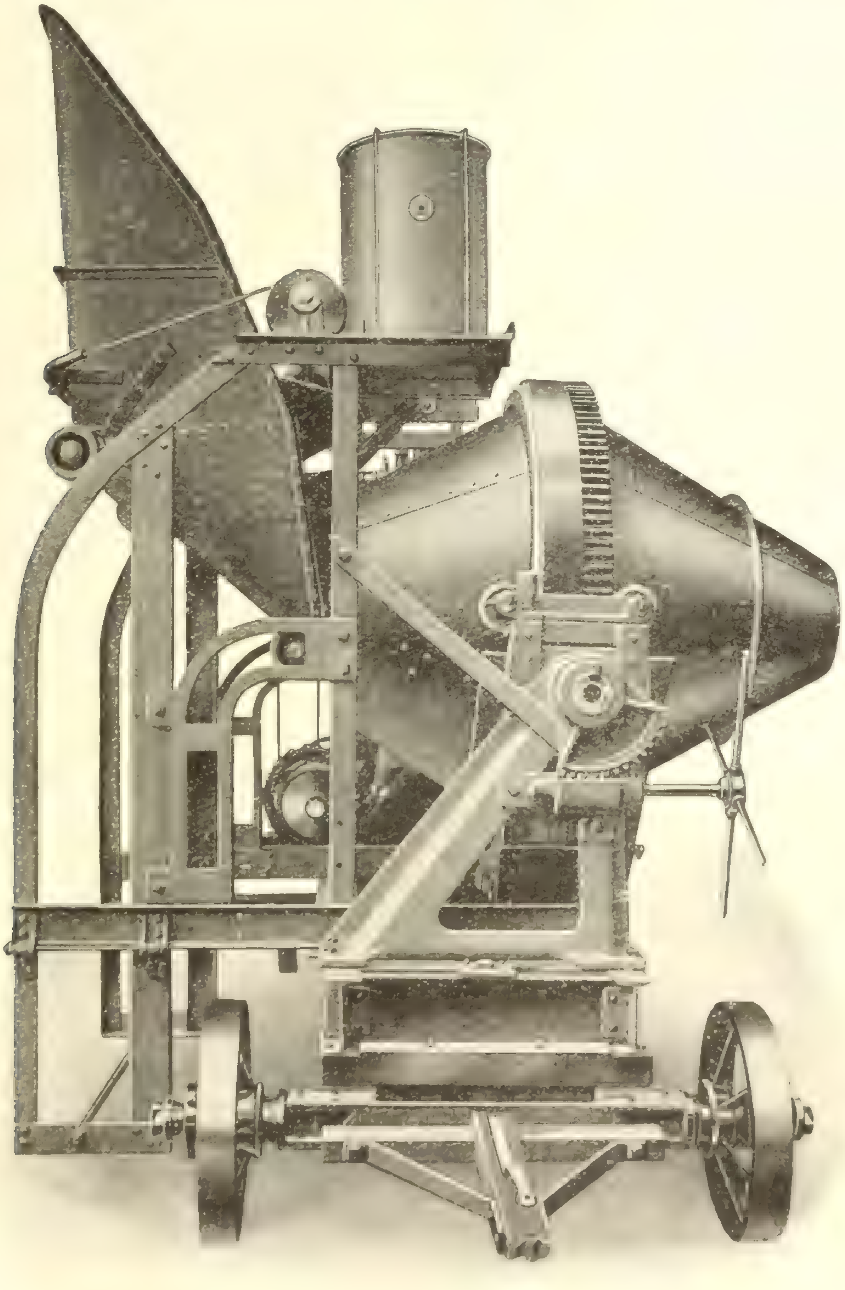
THE 1913 SMITH SIDE-LOADER

IS THE BEST EVER.

You load from the ground level and it cleans itself—no shovelling or knocking.



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Hoisting Apparatus
American Hoist & Derrick Co.
Beatty & Sons, M.
Browning Engineering Co.
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Doty Marine Engine & Boiler Co
Jenckes Machine Co.
Hopkins & Co., F. H.
Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F.

Hoisting Engines
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

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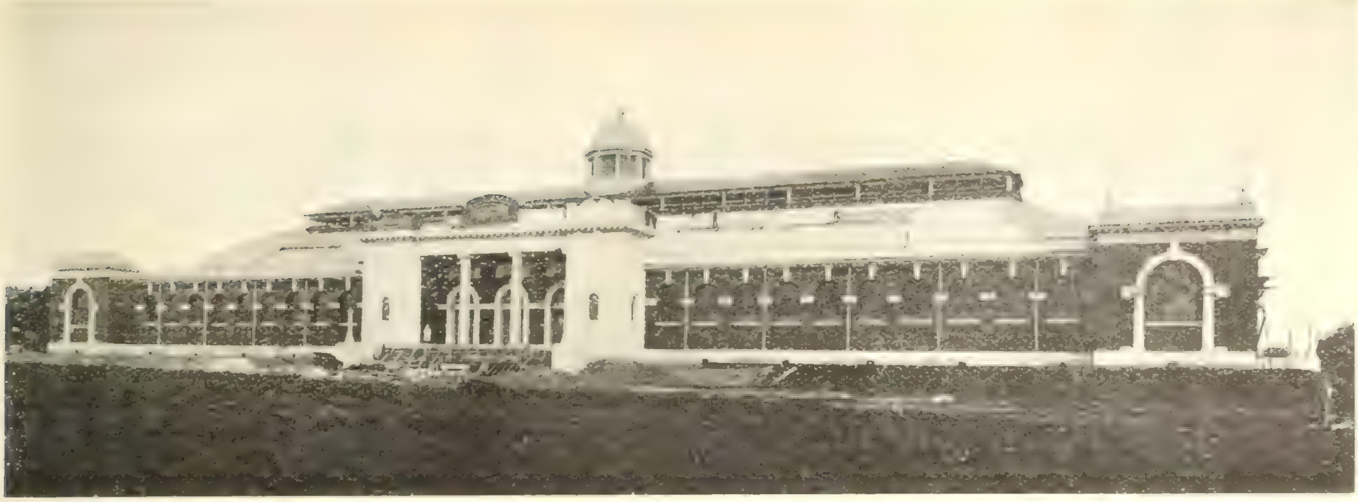


Transportation Building, Canadian National Exposition, Toronto

BUILT OF

Don Valley Bricks

THE building pictured above is admired by a million people annually and it is constructed of Don Valley Bricks.

This material was selected for its proven ability to withstand the destructing influence of time and erosion.

In every part of Canada may be found buildings of Don Valley Brick and Terra Cotta Fireproofing.

Specify Don Valley

Don Valley Brick Works

TORONTO, ONTARIO

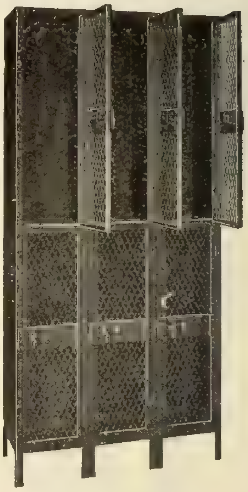
"STEELCRETE" STEEL LOCKERS

"STEELCRETE" STEEL LOCKERS

Locker Advantages

Wherever personal possessions must be left in the keeping of strangers, lockers provide the only really satisfactory arrangement of ensuring the safety of goods and the comfort of the possessor.

In waiting-rooms, dressing-rooms, cloak rooms, etc., lockers relieve those in authority of all responsibility of loss or damage and thereby form a permanent insurance against the many claims on property left in their charge.



"Steelcrete" Steel Lockers

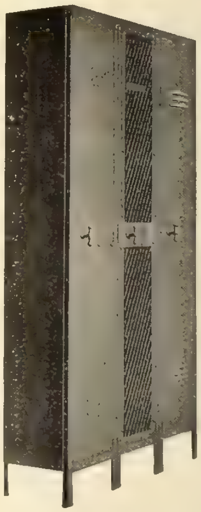
form a new type of safety lockers carefully thought out and designed and containing many advantages over the usual class of metal cage hitherto in use. These lockers are made all steel and are particularly suitable for

Warehouses, Gymnasiums, Schools, Clubs, Banks, Hospitals, Police Stations, Armouries, &c.

Steelcrete Steel Lockers are finished in olive green enamel and are exceptionally **neat** in appearance, **clean and sanitary,** and **solid** as a block of wood. They are constructed throughout of the finest high-grade steel and are unequalled for their Strength and Rigidity.

The Standard Sizes and fittings, etc., are carefully calculated to meet every ordinary requirement.

Made in "Single Tier" or "Double Tier" with sheet steel or expanded metal (open mesh) doors—combination locks or padlocks instead of rim locks if desired.



Write to Us—Our Prices will Interest You

STEEL and RADIATION

LIMITED

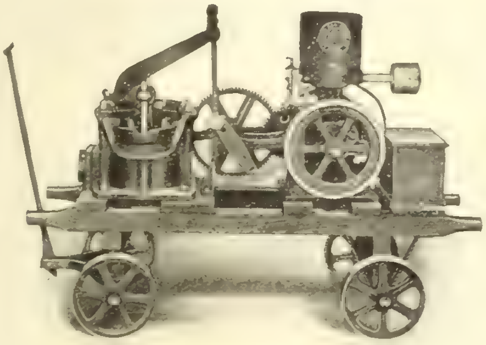
Toronto, Canada

"STEELCRETE" STEEL LOCKERS

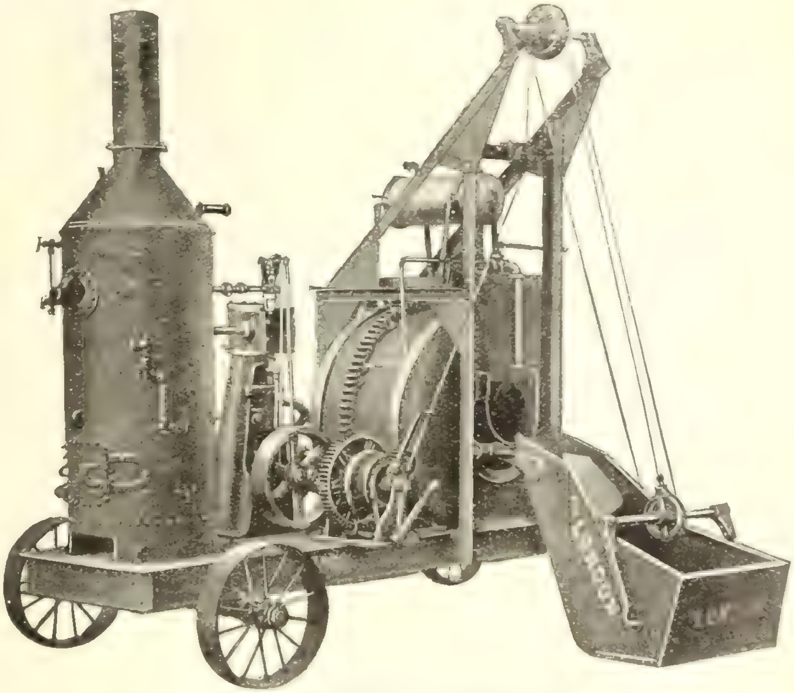
"STEELCRETE" STEEL LOCKERS

Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



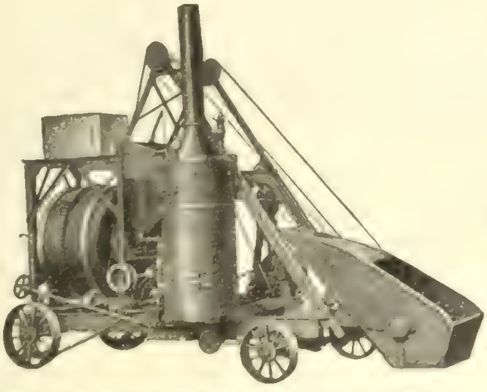
Power Diaphram Pump



London Standard Drum Batch Mixer

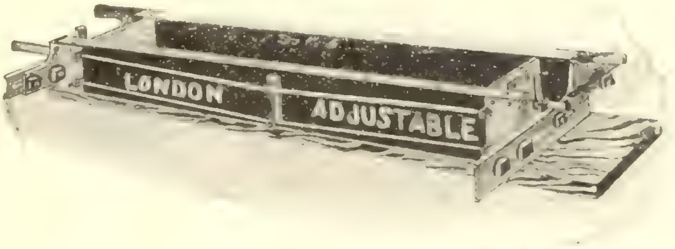
This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.

We are the largest manufacturers of Concrete Machinery in Canada.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.



London Sill Step and Window Cap Mould

A few lines we manufacture

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

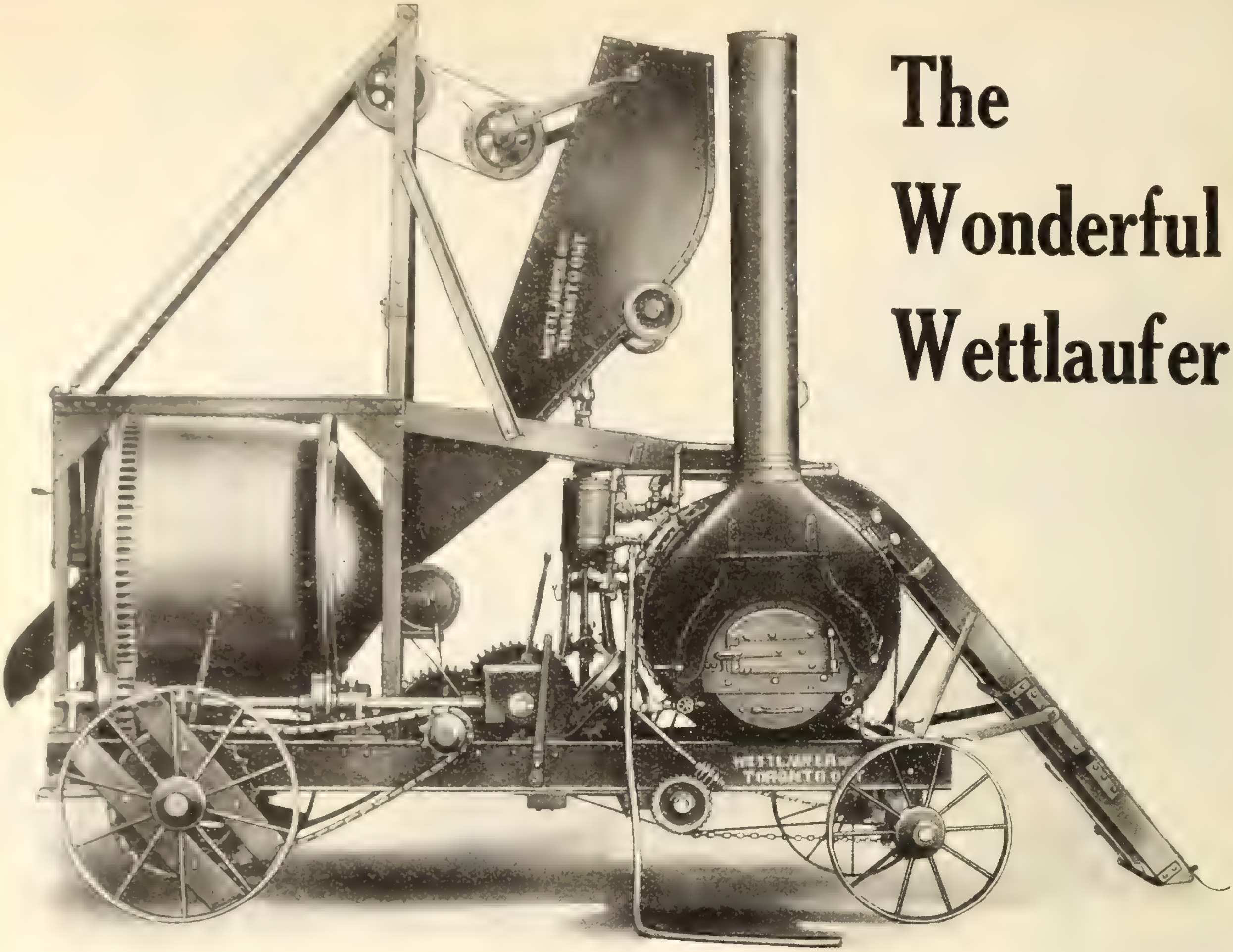
BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.

AGENCIES:

VANCOUVER, B. C. Equipment Co.
MOOSE JAW, SASK., Bridge & Iron Co., Ltd.
REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co.
MONTREAL, Foss & Hill Mach. Co.

The Largest Manufacturers of Concrete Machinery in Canada



The Wonderful Wettlaufer

This is another of the popular Wettlaufer Mixers—The Wettlaufer Improved Stationary Heart Shape Drum Traction Mixer.

A Few Points of Superiority

TRACTION wheels are 36″ diameter by 8″ face, giving large bearing surface, one man operates the entire outfit from one position.

When mixing, material is being turned in every possible manner.

In discharging, the drum empties clean. Drum can be thrown out of gear when tractioning or when not in use. One person can traction the entire outfit by turning the engine flywheel, showing the low power required to traction. The loading skip comes flat down to the ground and operates with one lever, making easy loading.

Extreme width only 7 feet making it suitable for work on car tracks and narrow streets.

Attend a daily demonstration at any of our branches and see the many other good features of this new mixer.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

A.E. Hodgert, Regina Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A.R. Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 405 Cadogan Blk., Cal. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J.L. Lachampe, 363 St. Paul St., Quebec.

"BEATTY" HOISTS

¶ Standard sizes of Hoisting Engines shipped from stock.

¶ Six sizes of Clamshells on hand.

¶ Quick shipment on any type of Excavating or Material Handling equipment for use on land or water.

¶ "Beatty Plant" on your work means continuous service and complete satisfaction.

¶ Let us give you the benefit of our Fifty Years of Experience in Building Contractors Machinery.

Full information gladly sent you. Write now.

M. Beatty & Sons, Limited

Welland, Ontario

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Batts Limited
Canada Office & School Fur. Co.
Rhodes Curry & Co.

Kilns
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Dominion Paint Works.
Goheen Mfg. Co.
Ottawa Paint Co.

Paints and Varnishes
Dominion Paint Works.
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Ontario Asphalt Block Co.
Paterson Mfg. Co., B.
Asphalt & Supply Co.
Barber Asphalt Paving Co.

Perforated Metals
Canada Wire & Iron Goods Co.
Greening Wire Co., B.

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Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Pedlar People.
Piggott & Co., Thos.

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Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.

Planing Mill Exhausters
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Plug Drillers
Canadian Ingersoll-Rand Co.

Plaster
Alabastine Company.
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

Plumbers' Supplies
Standard Ideal Company .

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Portable Saws
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

Power Engines
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Jenckes Machine Company.
Canada Foundry Company.
Waterous Engine Works.

Pumps and Pumping Machinery
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Ontario Wind Eng. & Pump Co.
Wettlaufer Bros.

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Improved Equipment Co.
Lecky & Collis.
George Anderson & Co.

Railway Supplies
Canada Foundry Co.
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Metallic Roofing Company.
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Ferranti Meters

Glass Case—Top Connections

Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
Top or bottom connections.
Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

Busy Contractors Use New Model Aurora Dump Wagons

because they want wagons that will haul the most material in the least time and that are on the job every working hour.

A novel feature has been added to this wagon which places it beyond comparison with any other on the market, namely, **a steel channel filled with wood for the main side board,** giving unusual strength. This is the portion of the wagon that stands the heaviest strain. With this reinforced side board, breakage is practically impossible. It is short coupled and built low. Light in weight. **Write today.**

Western Wheeled Scraper Co.
Aurora, Illinois
Earth and Stone Handling Machinery
Dominion Supply & Equipment Co., Winnipeg-Calgary-Edmonton—Agents for Manitoba, Saskatchewan & Alberta
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont.
Limited

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Sand and Supplies Limited
York Sand and Gravel Co.
Alfred Rogers Limited

Scraper Blades
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Canadian Mineral Rubber Co.
Lecky & Collis.

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Canada Foundry Company.

Ventilating & Heating Apparatus
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Canada Wire & Iron Goods Co.
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Wire Rope
Canada Wire & Cable Co.
Greening Wire Co., B.
Steel Company of Canada.

Wood Turnings
Lyster Wood Box Turning Enamelling Co.

The Maple Leaf Elevators, Port Colborne. J. H. Tromanhauser, General Contractor.
80,000 sq. ft. Barrett Specification Roofing on this building.

This building is but one of the many large contracts executed by us.
Our years of experience and large equipment are such as to enable us to handle these large contracts with promptness.
We can include for any specification along the lines of a Built-up Roof, Damp-proofing foundations, sub-floors, etc.
Kalameined and Tin Clad Fire Doors, Skylights, Cornice and all Sheet Metal Work.
Send along your plans and specifications at our expense, we will quote you a close price and return them promptly.

REGGIN AND SPENCE
Roofing and Sheet Metal Contractors
530 Front Street West - Toronto

Tarvia

Preserves Roads
Prevents Dust~

Prince Street, Truro, N. S. Constructed with "Tarvia X"—1910.
Truro has continued to use Tarvia every year since 1910 and will pave a large area with Tarvia Macadam in 1913.

The Modern Road Binder

Plain macadam roads are adapted to slow horse-drawn traffic. Modern traffic, with its high speed, disintegrates and destroys the ordinary macadam. Its mineral binder cannot resist the thrusts of a driving wheel.

Roads adequate for modern traffic must be bonded with something adhesive, ductile and resisting. Such a binder is Tarvia, a specially prepared coal tar compound which retains its good qualities through all weathers and seasons and holds the stone firmly in place resisting all classes of modern traffic.

Tarvia is made in three grades:—"Tarvia X" is a very dense material to use as a binder in the large voids of new construction; "Tarvia A" is of thinner consistency for surfacing operations; "Tarvia B" is used cold, can be applied from a sprinkling cart and is sufficiently limpid to percolate into the pores of an old and well compacted road.

"Tarvia X" is required where new construction is called for. "Tarvia A" and "Tarvia B" are used in improving and protecting roads already in use.

A tarviated road or pavement is practically dustless and mudless and the maintenance cost is, in most cases, so reduced as to more than save the cost of Tarvia treatment.

Booklets on request.

THE PATERSON MANUFACTURING COMPANY, LIMITED
MONTREAL TORONTO WINNIPEG VANCOUVER
THE CARRITTE-PATERSON MANUFACTURING CO., LIMITED
ST. JOHN, N.B. HALIFAX, N.S. SYDNEY, N.S.

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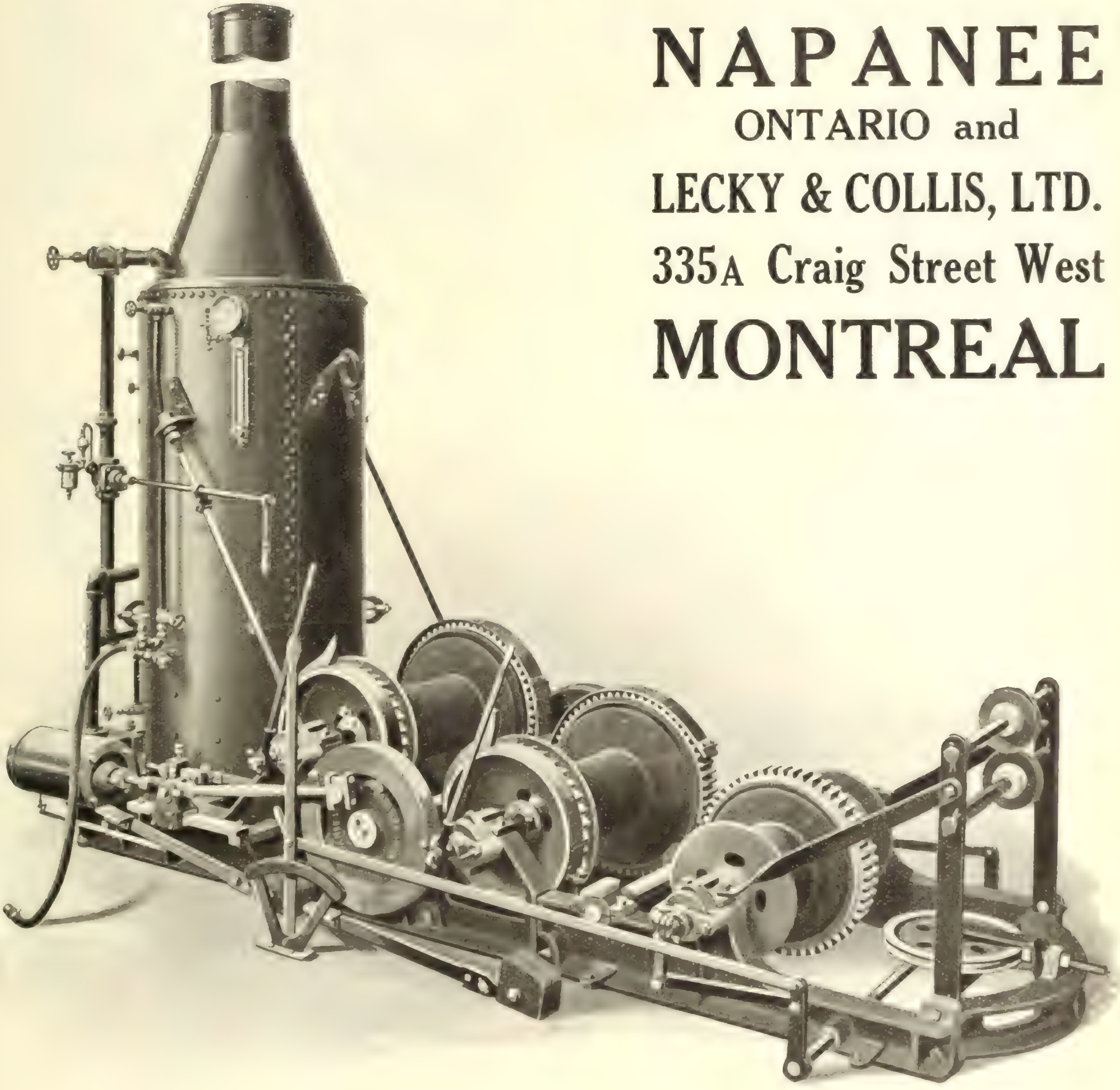

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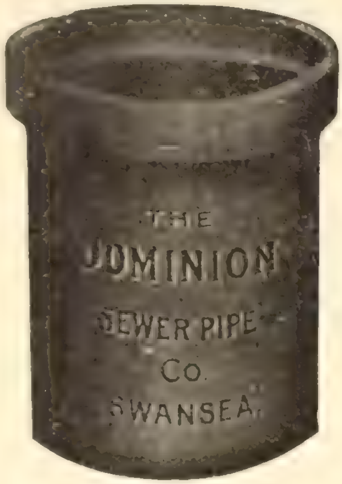

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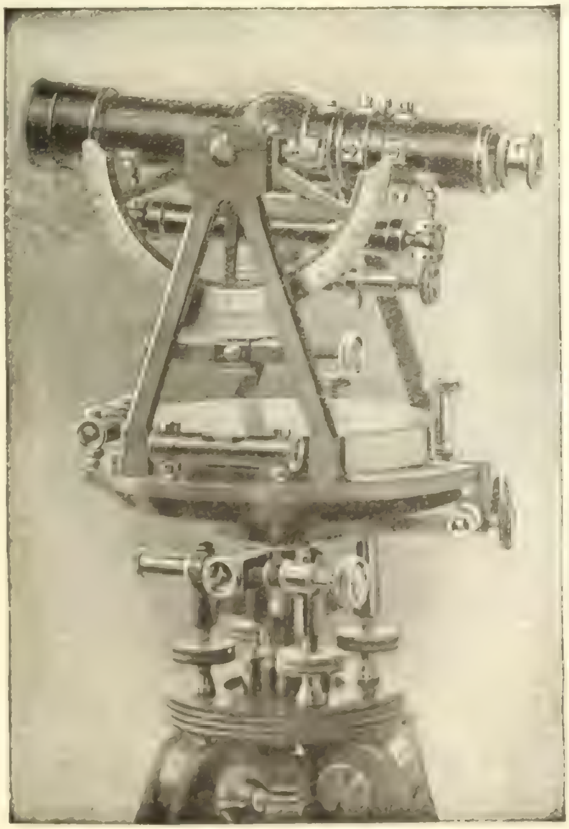

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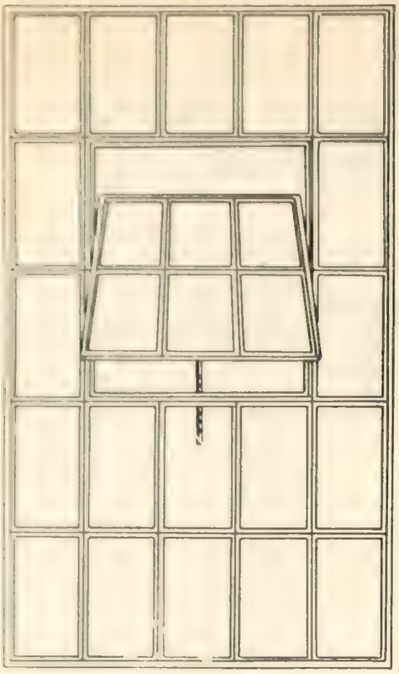

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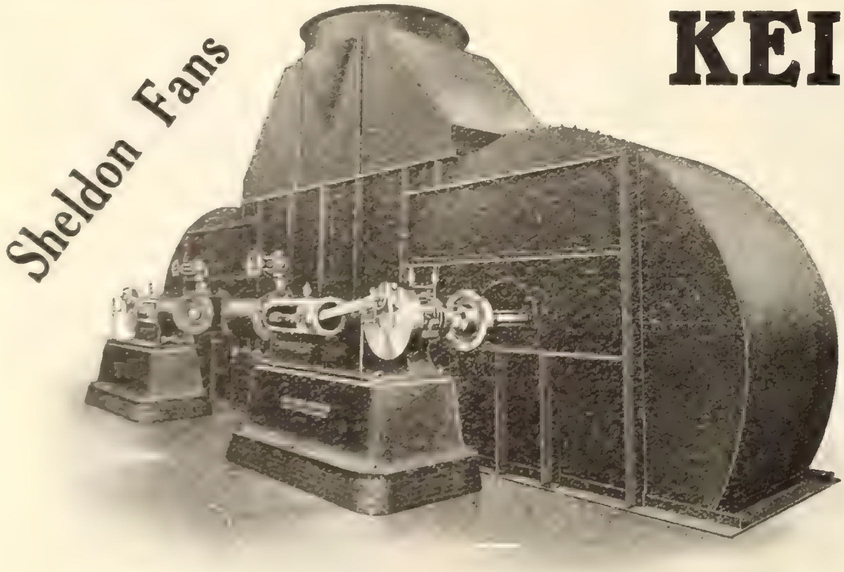

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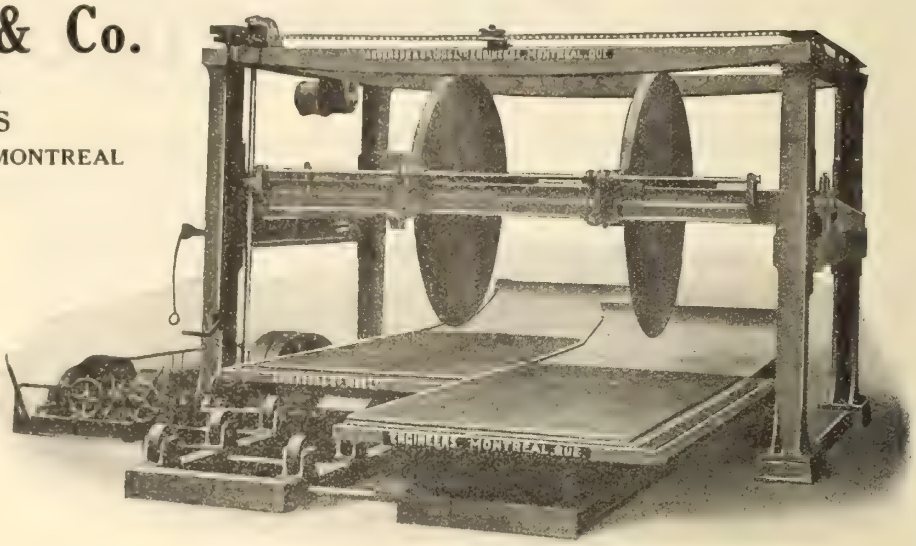

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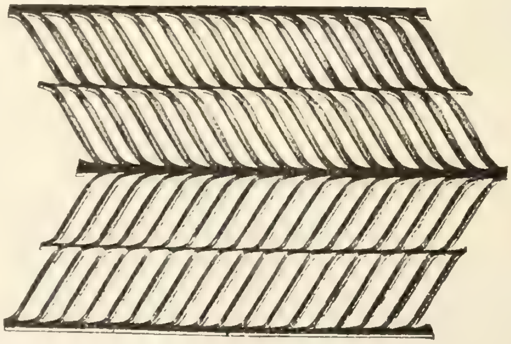

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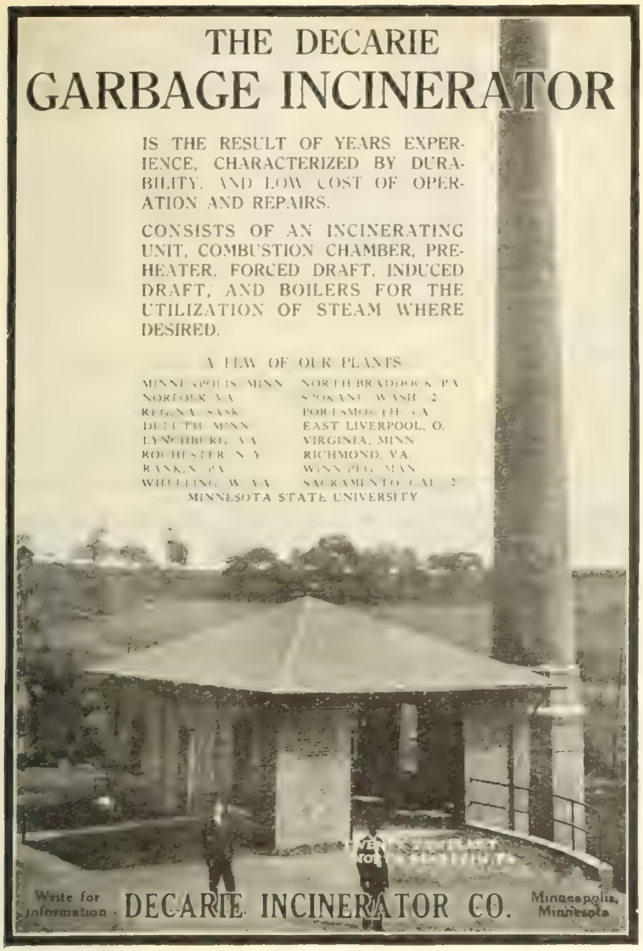

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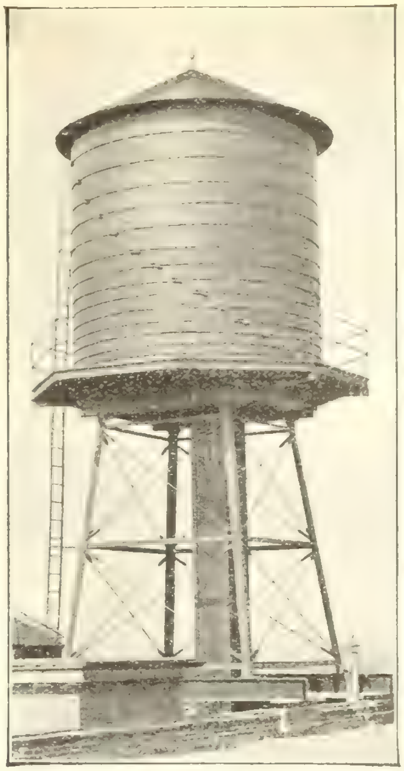

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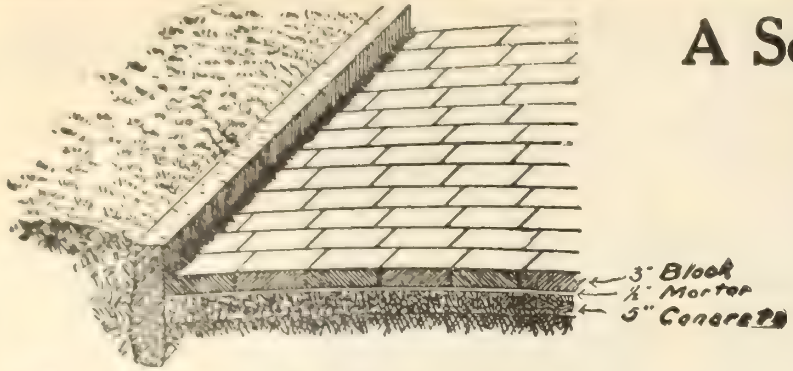

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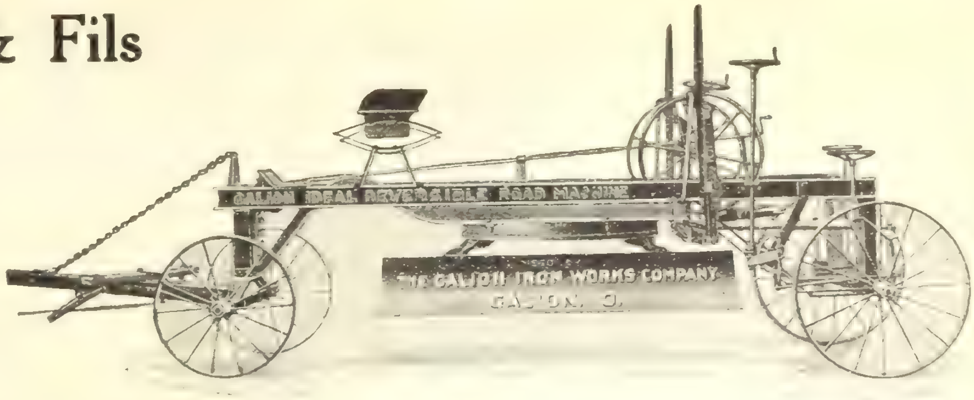
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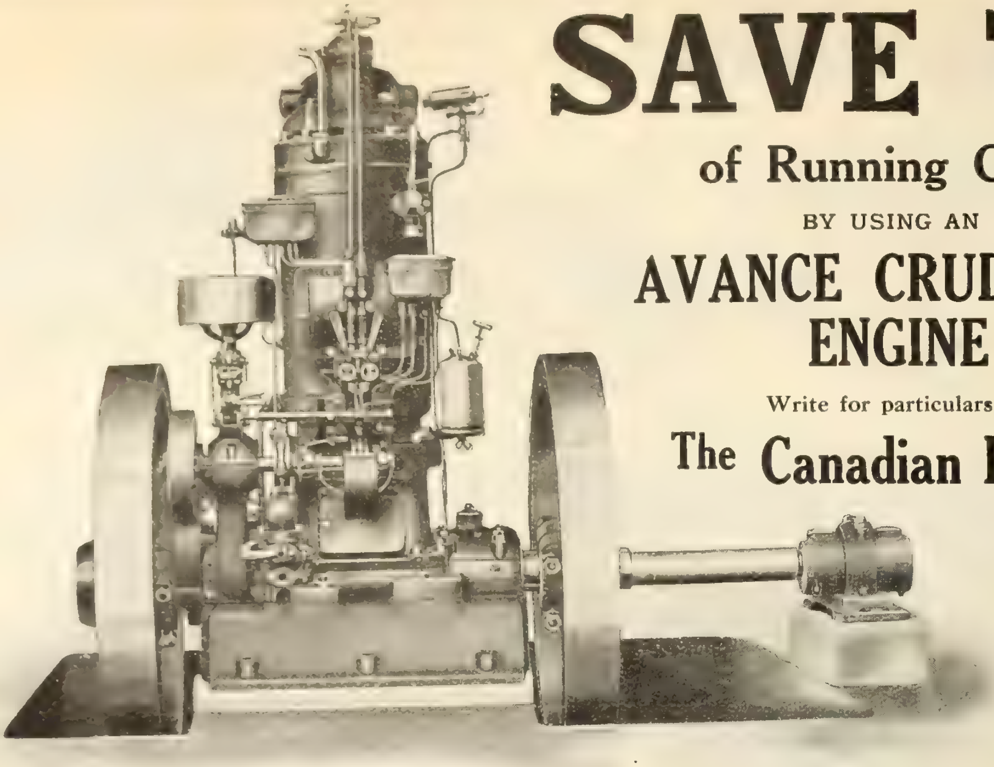

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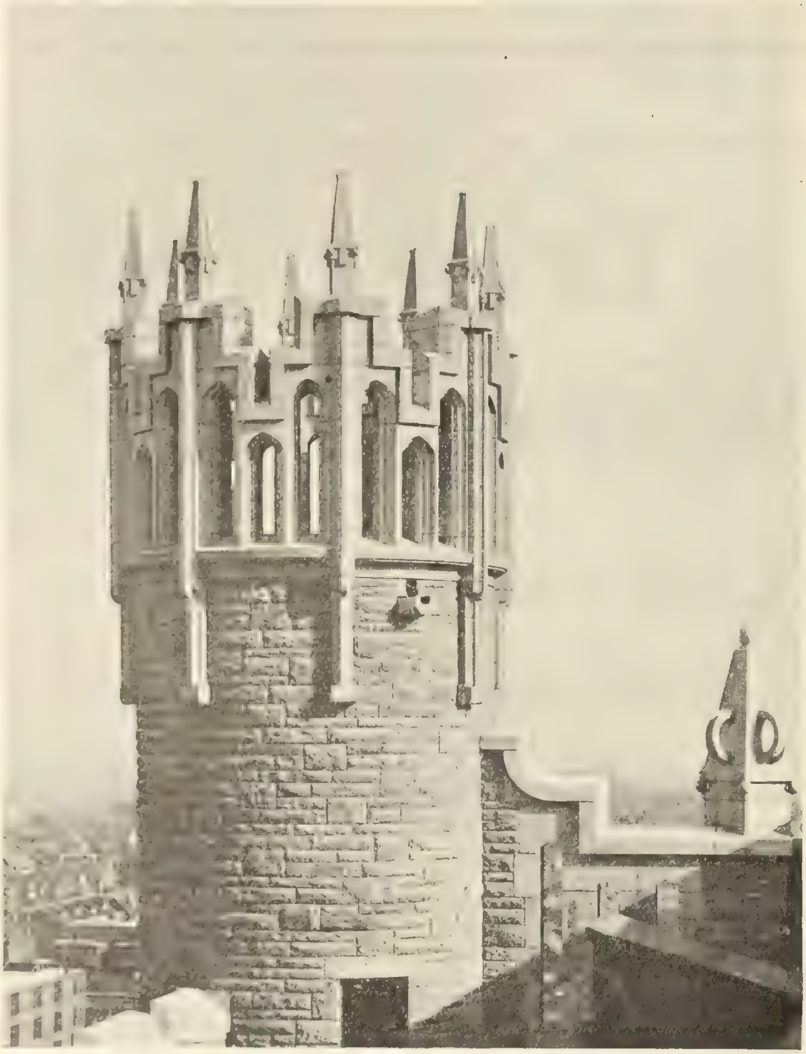

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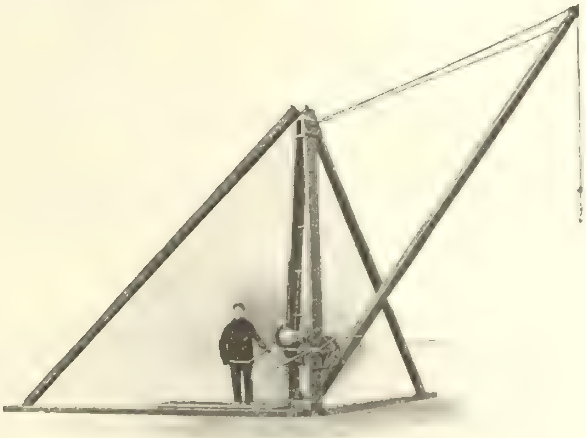

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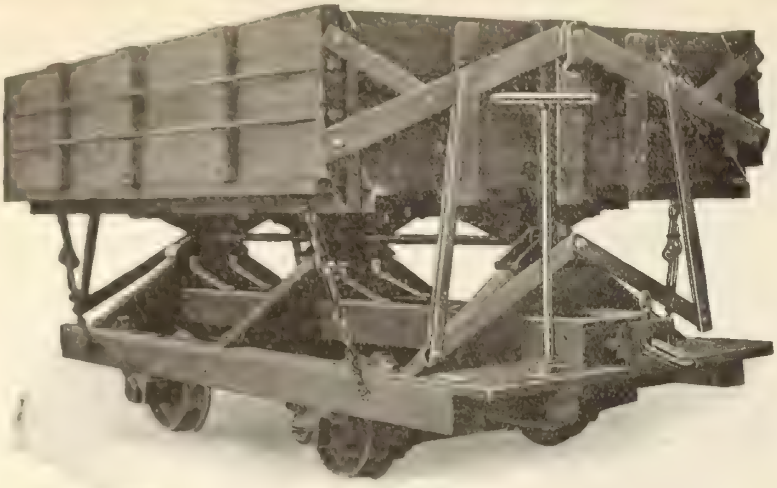

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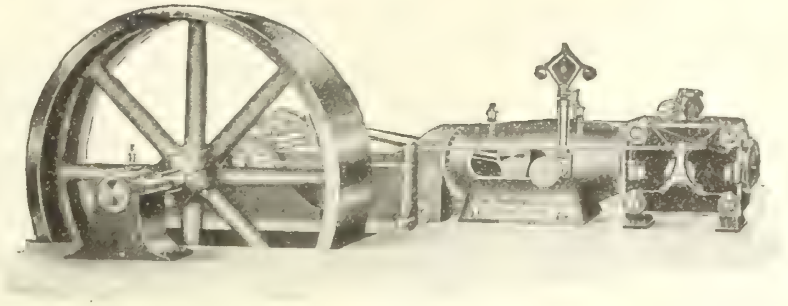

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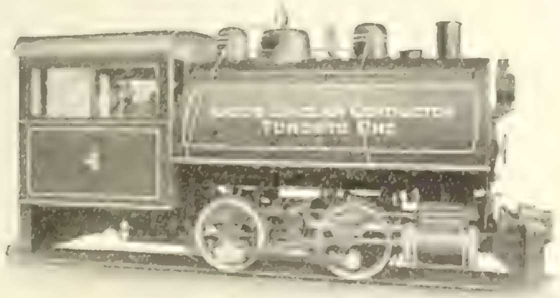

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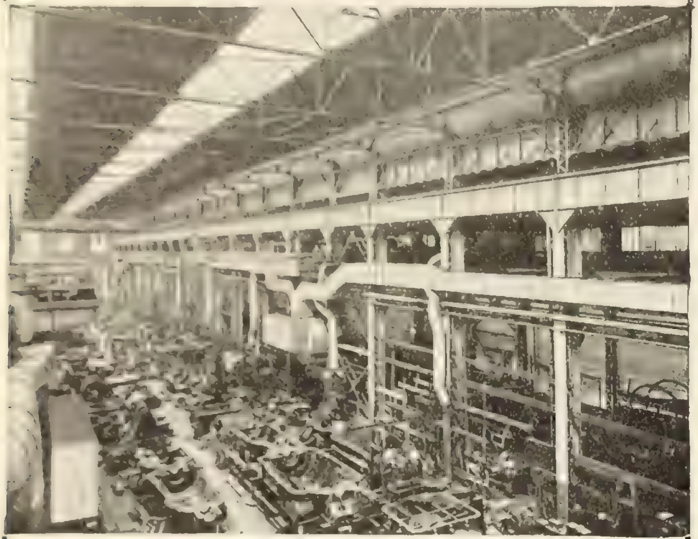

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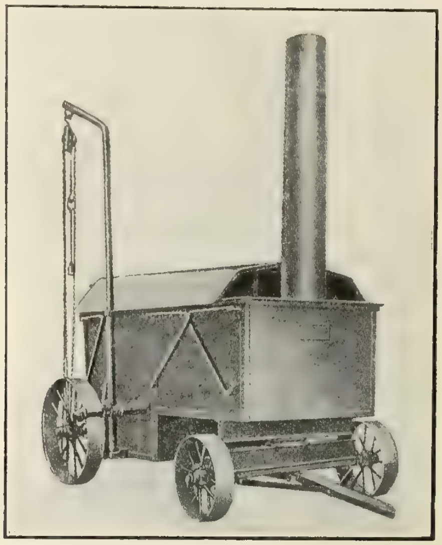

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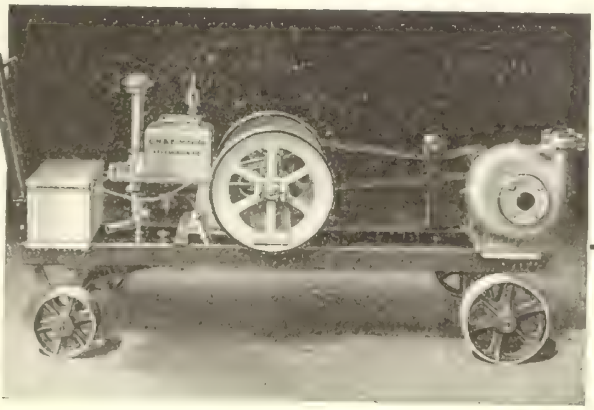

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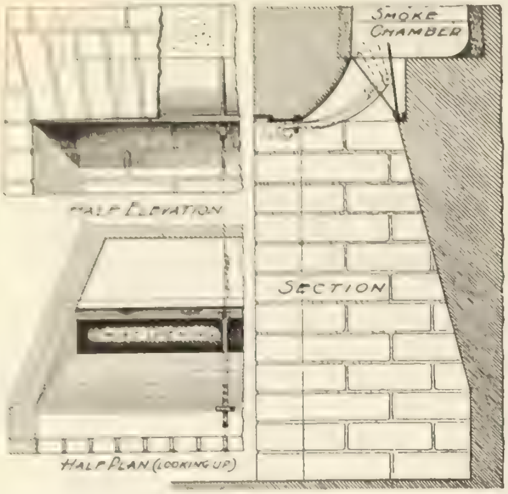

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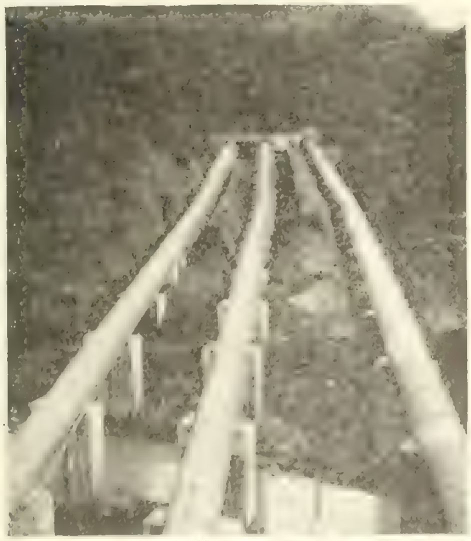

Penstock at plant developing [illegible] h.p. painted with "D.P.W. Special Penstock Paint."

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stand all these conditions and have been successfully used for years on the largest penstocks in the world, not only in Canada, but in the United States, South America, Mexico,—in fact the world over. Their PROTECTIVE VALUE and ULTIMATE ECONOMY has been proven time and time again, and they are chosen ***on their merits*** by the leading Hydro-Electric Engineers.

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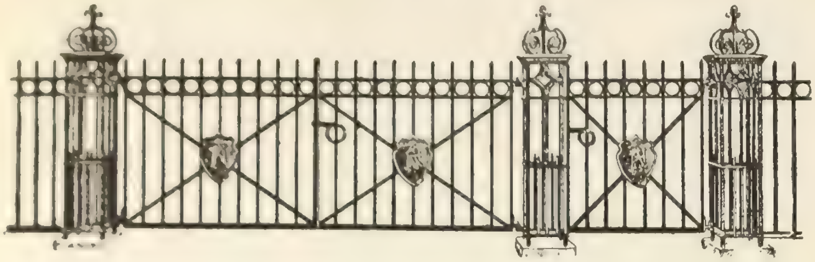

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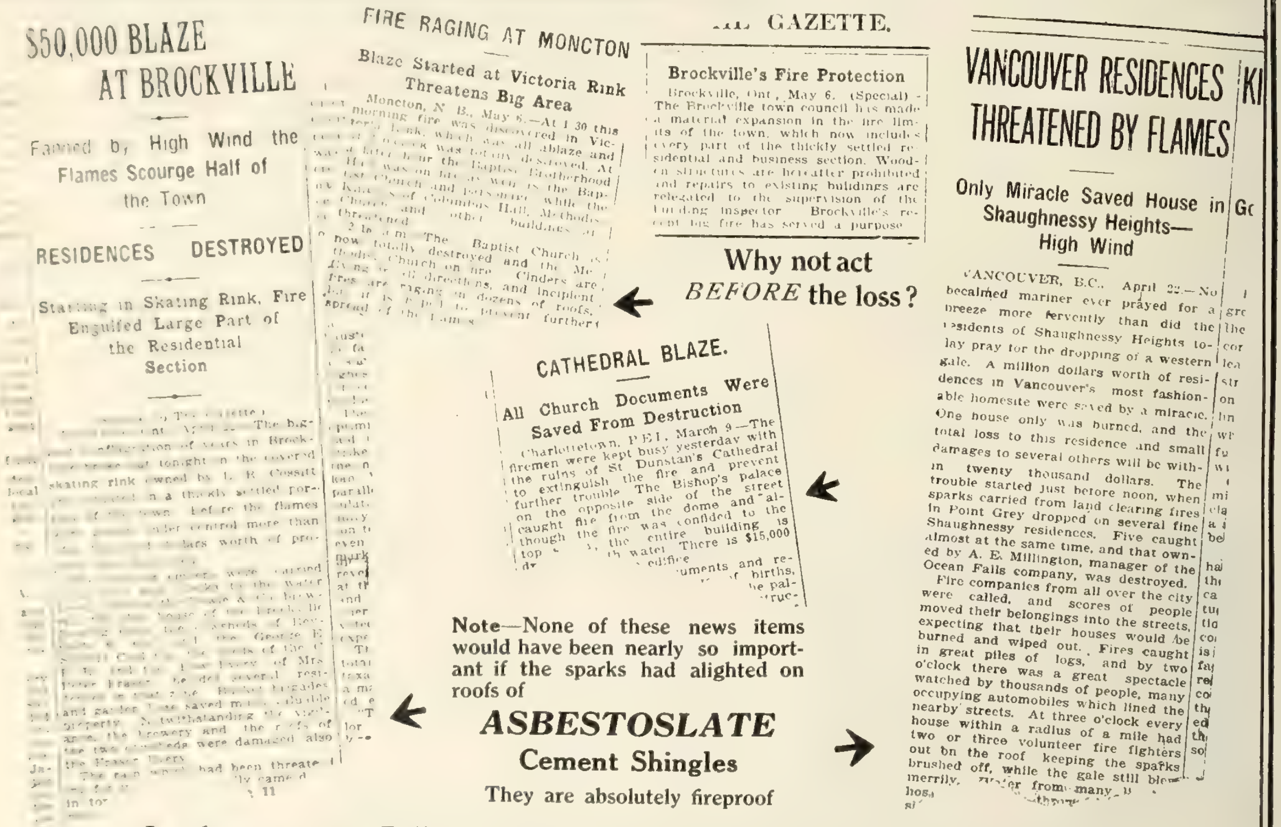

$50,000 BLAZE AT BROCKVILLE

Fanned by High Wind the Flames Scourge Half of the Town

RESIDENCES DESTROYED

Starting in Skating Rink, Fire Engulfed Large Part of the Residential Section

[illegible] (To The Gazette.) [illegible] The biggest conflagration of years in Brockville [illegible] tonight in the covered skating rink owned by [illegible] R. Cossitt [illegible] in a thickly settled portion of the town. Before the flames [illegible] under control more than [illegible] dollars worth of property [illegible]

[illegible] were carried [illegible] to the water [illegible] the brewery [illegible] the George E [illegible] of Mrs [illegible] several residences [illegible] brigades [illegible] and garden [illegible] saved much valuable property. Notwithstanding [illegible] the roofs of [illegible] the brewery and [illegible] were damaged also [illegible] the Fraser [illegible]

The rain which had been threatening [illegible]

FIRE RAGING AT MONCTON

Blaze Started at Victoria Rink Threatens Big Area

Moncton, N. B., May 6.—At 1 30 this morning fire was discovered in Victoria Rink, which was all ablaze and [illegible] was totally destroyed. At [illegible] hour the Baptist Brotherhood Hall was on fire as well as the Baptist Church and parsonage, while the Knights of Columbus Hall, Methodist Church and other buildings are threatened.

2.15 a.m.—The Baptist Church is now totally destroyed and the Methodist Church on fire. Cinders are flying in all directions, and incipient fires are raging on dozens of roofs, but it is hoped to prevent further spread of the flames.

[illegible] GAZETTE.

Brockville's Fire Protection

Brockville, Ont., May 6. (Special).—The Brockville town council has made a material expansion in the fire limits of the town, which now includes every part of the thickly settled residential and business section. Wooden structures are hereafter prohibited and repairs to existing buildings are relegated to the supervision of the building inspector. Brockville's recent big fire has served a purpose.

Why not act
***BEFORE* the loss?**

CATHEDRAL BLAZE.

All Church Documents Were Saved From Destruction

Charlottetown, P.E.I., March 9.—The firemen were kept busy yesterday with the ruins of St Dunstan's Cathedral to extinguish the fire and prevent further trouble. The Bishop's palace on the opposite side of the street caught fire from the dome and although the fire was confided to the top [illegible] the entire building is [illegible] with water. There is $15,000 [illegible] edifice [illegible] documents and records of births, [illegible] the palace [illegible] destruction.

VANCOUVER RESIDENCES THREATENED BY FLAMES

Only Miracle Saved House in Shaughnessy Heights—High Wind

VANCOUVER, B.C., April 22.—No becalmed mariner ever prayed for a breeze more fervently than did the residents of Shaughnessy Heights today pray for the dropping of a western gale. A million dollars worth of residences in Vancouver's most fashionable homesite were saved by a miracle. One house only was burned, and the total loss to this residence and small damages to several others will be within twenty thousand dollars. The trouble started just before noon, when sparks carried from land clearing fires in Point Grey dropped on several fine Shaughnessy residences. Five caught almost at the same time, and that owned by A. E. Millington, manager of the Ocean Falls company, was destroyed.

Fire companies from all over the city were called, and scores of people moved their belongings into the streets, expecting that their houses would be burned and wiped out. Fires caught in great piles of logs, and by two o'clock there was a great spectacle watched by thousands of people, many occupying automobiles which lined the nearby streets. At three o'clock every house within a radius of a mile had two or three volunteer fire fighters out on the roof keeping the sparks brushed off, while the gale still blew merrily, water from many [illegible]

Note—None of these news items would have been nearly so important if the sparks had alighted on roofs of

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They are absolutely fireproof

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Residence of Mr. John Neuscheler, River Edge, N.J., covered with J-M Asbestos Stucco.

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Nothing is more durable than rock, and J-M Asbestos Stucco is made form Asbestic (which consists of ground asbestos rock and fibres). It is combined with Portland Cement, thus forming a tough exterior finish which will not crack or crumble as ordinary sand and cement stuccos do.

J-M ASBESTOS STUCCO

is uniform in size and susceptible to a great variety of texture effects in the surface treatment.

It dries with an artistic uniform permanent color effect.

J-M Asbestos Stucco is lighter in weight, can be applied more evenly, smoothly and cheaply than ordinary sand and cement stucco. In prepared form, it can be furnished in white, also in various shades of gray, buff and brown.

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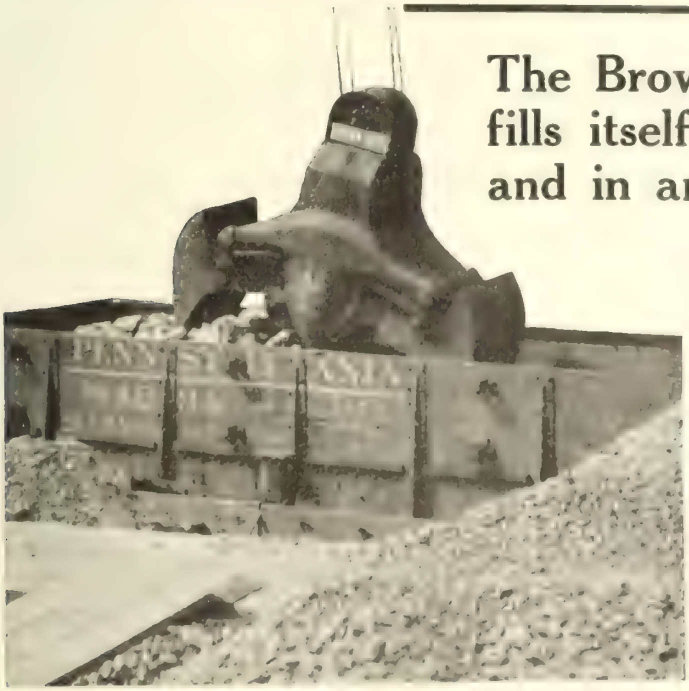
The Brownhoist Grab Bucket fills itself in crushed rock, lump coal, and in any other loose material



The spades are so shaped that when digging, the material gathered causes the bucket to dig deeper into the material insuring a full load.

And when digging, the bucket is prevented from skidding over any lumps

by the spades being at an angle and never horizontal

by the side portion of the spades being cut away, as shown

and by the high closing power of the bucket.

Write for catalog F. which shows how and where the Brownhoist Grab Buckets are used.

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An editorial in "Electrical Merchandise" published in New York says in part as follows:

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A visit to our salesroom will prove just what the above editorial says.

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Rubber Valves "
HOSE
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Steam Hose "

"Write Goodyear after every item on that list."

DON'T take a chance on these items. Your factory cannot give high efficiency with inferior equipment.

A valve leaking—a belt stretching—a hose bursting. These may not seem very serious in themselves, but from the standpoint of "lost time" and "disorganization" they *are* serious.

And they are *avoidable*. Install reliable equipment—goods that have a trouble-saving reputation among factory superintendents and practical men.

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Goodyear Belting saves power by its close, non-slipping grip of the pulleys. It is a non-stretching Belt—therefore avoids loss of time for "taking up." Its "long life" is a positive economy.

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So diverse are the conditions surrounding the use of *Steam Hose*, that these should be specially stated when ordering. We make Steam Hose to meet every condition of service, and Goodyear Steam Hose will give the highest satisfaction.

Goodyear *Suction Hose*—smooth or rough bore. Steel wire wound internally to prevent collapse. Built for every conceivable purpose; oil, gasoline, acids, etc.—made in all sizes up to 16 inches.

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MAGNET RED SHEET PACKING for the special requirements of machine shops and boiler rooms. It is particularly adapted for high pressure service, being made of special heat resisting compound. Makes a tight joint against pressure from air or hot water. It is unaffected by oil and settles into a close impenetrable joint under heat.

MAGNET GASKET TUBING—makes a tight joint against high pressure. Can't blow out. Can be cut to fit the job. Supplied with rubber core and [illegible]

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Alphabetical Index of Advertisers
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Vol. 27 June 25, 1913 No. 26

Safety in Reinforced Concrete Construction

WITHIN recent years no building material has been more thoroughly investigated and tested than reinforced concrete. Testing institutes, universities, engineers, and contractors have contributed the results of their experiments with the material and also with completed structures. The results, published widely in the North American and European technical press, have had a great influence in securing safe and adequate design and construction, not only by the positive facts disclosed, but also by showing reinforced concrete engineers how they can set on foot investigations without any special equipment of machinery, and thus make themselves familiar with the properties of the material and practical requirements.The test beam mentioned in Mr. Elmont's article (pag(57) on "A Practical Method of Testing Reinforced Concrete Structures" is an interesting example of such a method of investigation suitable for the laboratories, engineers or contractors, and therefore of importance in improving the ability of those concerned in handling a structure in the right way.

Recent reinforced concrete failures in Detroit, Kansas City, Chicago, etc., point a moral which Canadian engineers, architects, and contractors, should bear in mind, in order to avoid similar disasters, involving the loss of life and a large amount of property. In some instances the collapse of the buildings was due to the weakness of designs supplied by firms whose main interest was to sell the steel, or by engineers whose experience was chiefly in structural steel work, and who undertook to design a reinforced concrete structure after a study of one or two of the standard books. These men were able to figure out a slab, beam, and column, without understanding the stress distribution due to the monolithic action, and without knowledge of the practical requirements involved. In other cases, contractors prepared designs which architects did not consider themselves bound to get checked by a reliable and experienced engineer, but which were unfortunately too far away from the standard of good practice to be safe. There was another instance where failure was due to lack of experience by the contractor. While the design for the ten-storey building was first-class, the contractor had a very poor conception of reinforced concrete work, having only carried out jobs for abutments, walls, and foundations in plain concrete. This was combined with the fact that the architect inspected the work himself, although it was one of his first reinforced concrete jobs, and his structural knowledge, in relation to the kind of work he undertook to do himself, was found to be indefensibly small on investigation by a legal tribunal.

So far only very few failures in reinforced concrete structures have occurred in Canada, and this immunity can be continued if architects will place contracts for such structures in the hands of firms of good standing, and also allow the designs to be checked and the erection inspected by engineers who are qualified for this particular class of work.

Harnessing the Ocean

"Man marks the earth with ruin,
But his control stops with the shore."

So gleefully sang Byron a century ago, but few today would have the hardihood to set any such bounds to man's ingenuity and aggression. We are no longer satisfied that the great deeps should merely carry away sewage or bear the keels of commerce. The Senate of the United States has seriously discussed the erection of an artificial barrier whereby the currents from the Arctic and the Equatorial regions shall be deflected from their respective courses, and the face of the whole northern continent changed. Engineers assert that the force of the tides and waves now dashing idly against the shores may be made to light our homes and cities, to haul our loads and to lift our burdens.

A recent issue of "Nature" contains a discussion by Mr. C. A. Battiscombe, on the commercial possibilities of hydro-electric installations in the British Isles, particularly with regard to the use of tides. The author found that two previous attempts had been made to utilize tide motions; one attempt failed, probably because of the short time during which the power could be used; the other installation was yet working with fair results. It was shown that the difficulties presented by the project were two-fold—the maintenance of constant power and the cost of construction. Two ways of overcoming the first obstacle were suggested. Dual plants might be erected at points along the coast where the difference in the time of the tide would permit the turbines to be kept alternately in operation. The power thus generated could be transmitted to a central station and from there distributed. The second plan is favored by Mr. Batticombe on the ground of the expense of construction. Investigation showed that the available head of water could not exceed one-third the range of minimum tides. To procure a constant head the turbine chamber would be connected with the tidal-way by valves and with three reservoirs in which the water is imposition. As the tide fell below the necessary height the reservoirs would supply a constant flow until the tide set back again.

This is a matter of considerable importance to the people of Great Britain, where practically the only fuel in use is coal. The question of supremacy is to a large extent a question of fuel, and while the coal areas of Britain show few signs of exhaustion, there is no reason why the coal measures should not be further conserved, if cheap and effective power can be obtained from tidal action.

The question of costs is, of course, vital. The writer of the article quoted pointed out that cost might be reduced by a careful selection of the location and in the determination of structural details. The estimated cost for a hydro-electric installation of 20,000 h.p., where the range of neap tides is 20 feet and of spring tides 38 feet 6 inches, was placed at about $4,700,000. This seems a modest amount in a day of vast engineering expenditure. It is to be hoped that British financiers or the government itself will provide the funds necessary for a complete investigation of the possibilities of power from this source.

With the advent of this suggestion from England comes word of upwards of twenty wave motors either in operation or under construction on the Pacific coast of United States. At Venice, California, it is planned to develop electricity by using a wave motor to pump sea water to a height of forty feet, through a three-inch pipe into storage tanks, then to allow the water to run through the turbines. A wooden plane two feet beneath the surface of the ocean is connected with a large wheel by two timbers. The plane responds to both the outward and inward wave movement and causes a large wheel to oscillate. The power is transmitted by means of steel wire cables to four pumps. At San Diego it is proposed to generate power without the use of a pump. The town of Huntingdon Beach has granted a concession on the municipal wharf, in return for which the company has undertaken to light the town by means of a wave motor. These attempts to utilize the hitherto unexploited power of the ocean will be followed closely by the engineering profession and scientists in general.

Greatest Piece of Engineering Work in the World

MEASURED by the amount of money to be expended, the largest piece of engineering work ever undertaken in the world, not even excepting the Panama Canal, is the New York Rapid Transit Subway System on which the final steps have been taken by the signing of the final contracts between the city and the Interborough and Brooklyn Rapid Transit Companies. According to the official statement made by Borough President McAneny, the total expenditure on the extensions of the Interborough System, for both construction and equipment, will amount in round numbers to $140,600,000, and on the Brooklyn Rapid Transit System to $161,200,000. This makes a total of nearly $302,000,000. Adding to this the expenditure on third-tracking and other improvements on the elevated lines and such work as the Steinway tunnel, which is to be included in the new system, the total investment will approximate some $330,000,000. Adding to this the investment already made in the existing subway system, we arrive at a valuation of the entire subway system when completed which will considerably exceed the cost of the Panama Canal work.

A considerable mileage of the new subway work is already under contract. The total amount of contracts already let is some $75,000,000. Contracts are still to be let on the work to the amount of $160,000,000.

The amount of engineering work involved in the construction will be considerably greater than that involved in executing the comparatively simple work on the Panama Canal construction. There are now about 750 employees on the engineering staff of the Public Service Commission and 200 to 250 more will be necessary. The most important and most difficult part of the engineering work was the preparation of the general design, which has already been completed. What remains to be done is chiefly supervision and inspection of the actual construction work.

The importance of the new lines in adding to the transit facilities of the great city can hardly be overestimated. As to whether their earnings will be sufficient to pay interest on the enormous investment involved, there are so many varying and conflicting opinions that we shall venture to express none here. This much, however, is certain, that the city's representatives in the Public Service Commission and the Board of Estimate, who have given years of study to the subject of transit development and to the best methods of securing it for the city, are satisfied that the great development now to be undertaken is necessary for the city's welfare, and that the terms on which it is to be carried out represent the best that it was possible for the city to secure.

The entire system is to be completed and ready for operation by January 1st, 1917.

Testing Concrete Door

The British Fire Prevention Committee has recently published very valuable information concerning tests on reinforced concrete doors. The first door had a T iron rim and expanded metal and flat iron reinforcement filled in with concrete. This door was made to slide on the outside of an opening. The second door was similar to the first but fixed on the inside of an opening. These doors were subjected to the action of fire for 150 minutes, the temperature being raised gradually to about 2,000 F. Water was then applied for two minutes on the fire side. In 32 minutes the outer face of the outer door was still too hot to bear the hand and in 140 minutes the lower half of the door had bulged outwards. In seventeen minutes cracks appeared all over the fire side of the inner door and continued to grow in number; in 107 minutes this door fell away from the runner at the top corner and in 150 minutes fell forward into the interior of the hut. When water was applied to the inner surface of the outer door the material was eroded where struck by a jet. These tests afford some useful lessons and give information which should lead to the design of an efficient fireproof reinforced concrete door.

Only the steady last. Call to mind a dozen men who have made their mark—choose them from trade or profession—and you'll find that at least ten out of the twelve were men who hung fast to a "fixed idea"—who endured self-denial and difficulties and won out because they didn't "peter out."

They believed in themselves—they thought that they could do a certain thing and counted that more than the concentrated opinion of everybody else.

Water Supply and Sewerage Problems

The Last of a Special Series of Articles—Sewage Composition and Agents Active in its Reduction - Various Methods of Disposal — Summary

By W. Muir Edwards, M.Sc., C.E., Professor of Civil and Municipal Engineering in the University of Alberta.

AT the present time the whole matter of stream pollution is being looked into by a committee of the Federal Parliament whilst each Province is busily engaged trying to enact and enforce laws that are both reasonable and adequate in their protective force. In considering the vexed question of sewage disposal it is well to keep two or three points clearly in mind. The first of these is the nature of sewage, its composition and physical characteristics. Domestic sewage is composed largely of water, its appearance being that of the wash water drained from the tubs in the laundry. It is well described as "a dirty grey liquid, possessing an unpleasant sweetish odor scarcely noticeable in the open air and not repugnant even in sewers. It reaches the outfall in a continuous stream, upon the surface of which may be seen matches, corks, fruit skins, vegetable remains and lumps of faecal matter. If a fine sieve is placed in the current of the sewage so as to retain solid matter and these are examined they will be found, in addition to the above mentioned, to consist of flocculent and fibrous material, rags and small bits of paper with perhaps a few hairs and other similar substances." (Principles of Sewage Treatment—Dunbar and Calvert).

Domestic sewage, as has been said, is mainly water, only 200 to 800 parts per million being solid matter. Of this solid matter about 50 per cent. is mineral and therefore inoffensive and to be disregarded except in so far as the physical aspects of its ultimate disposal are concerned. The remaining 50 per cent. is organic matter, of which about three-fifths is in solution and two-fifths in suspension. In addition to the organic matter fresh sewage contains bacteria in large numbers. The majority of these are quite harmless and are indeed necessary to the chemical processes taking place. Since, however, the excreta of persons suffering from intestinal diseases may be present in the sewage, the pathogenic bacteria accompanying these diseases may also be present. These pathogenic bacteria carry the "power for evil" that may be present in the sewage and thus their destinies must have careful oversight in order that this "power" may remain in an undeveloped condition.

The second point to be borne in mind is that the complex organic compounds present in the sewage, either in suspension or in solution, will undergo chemical changes and be finally reduced to elementary staple forms. This reduction is brought about by distinctive bacteria, and its final result is arrived at by two processes. The first is termed putrefaction and the second or final stage is known as oxidation or nitrification. The bacteria which are active in the first stage are known as anaerobic and are distinguished by the fact that they live and multiply in the absence of air. The second stage is brought about by bacteria known as aerobic, their distinctive characteristic being the need of air for their activities. In passing, it might be mentioned that a third class of bacteria is active in the continuous process and is known as facultative, being distinguished from the other two groups in that they can exist and multiply either with or without the presence of air.

The third point is a very important one, as about it gathers the whole science of sewage disposal without the creation of a nuisance. It is the fact that if putrefaction, the first stage in the reduction process, be carried too far, offensive gases, mainly hydrogen compounds such as marsh gas, sulphuretted hydrogen, etc., will be given off, whilst on the other hand, the products of the second stage, oxidation, are gases and other compounds quite inoffensive and harmless. If, then, by the exclusion of the oxygen of the air, we inhibit the growth of aerobic and encourage the growth of anaerobic bacteria, the processes of putrefaction will go forward to the production of noisome gases and a serious nuisance will result. A very good example of such a state of affairs is the ordinary cess-pool. Since the anaerobic bacteria are active liquifying agents some of the organic matter in suspension will be put in solution and the complexity of its chemical composition will be simplified somewhat, but meanwhile most objectionable gases will be given off and in many cases a serious nuisance is created, and until conditions suitable to oxidation are brought about the organic matter will not be reduced to inoffensive, simple, staple forms. The disposal of the sewage must thus satisfy two distinct conditions. First, there must be no reasonable ground for expecting that pathogenic bacteria present in the sewage will find their way into the human system and so propagate disease. Second, there must no nuisance created, either to the municipality from which the sewage comes or to another municipality or persons below the outfall.

To accomplish the first of these conditions, either the water into which the sewage flows must not be used as a source of supply for domestic purposes, or the pathogenic bacteria must be eliminated, by the artificial treatment of the fresh sewage, by natural processes in the drainage channel or by a treatment of the polluted water before the latter is used as a source of supply. To ensure the accomplishment of the second condition, namely, that a nuisance shall not be created, the processes of putrefaction must not go forward to a point at which offensive gases are given off. To prevent such a condition being brought about, the necessary supply of oxygen must be brought in close contact with the organic matter in the sewage, in order that the aerobic bacteria may be active and oxidation may be the process by which the complex organic compounds are reduced to simple forms. If the oxygen be supplied in abundance, the action is correspondingly rapid. If the supply be limited the aerobic action is retarded, while an inadequate supply will result in the exhaustion of the oxygen and a reversal to anaerobic conditions accompanied by the formation of offensive hydrogen gases. Disposal works improperly run and streams loaded beyond the

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* The 1st, 2nd, 3rd, 4th and [illegible] of the series were published in our issues of Feb. [illegible], Mar. [illegible], April [illegible], April [illegible] and May [illegible] respectively.

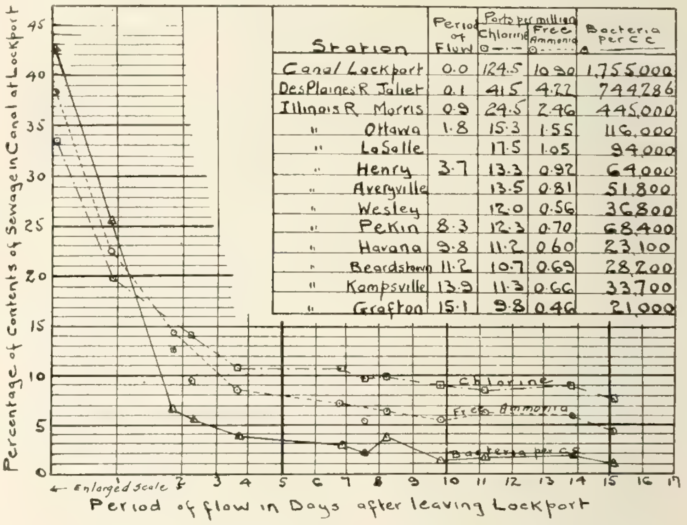
self purifying capacity may pass this critical point and what was once a satisfactory method of disposal becames the subject of serious complaint by the public.

Having dealt with the general aspects of the whole subject it might be well to consider in detail (1) the common method of sewage disposal by dilution and (2) the methods of treatment to which the sewage may be subjected with a view to producing (a) a non-putrescible effluent, (b) a bacterially pure effluent.

Disposal by Dilution

The majority of water carriage systems deliver the raw sewage into a stream, lake or tidal water, and rely on the self purifying powers of such a body of water to digest the organic matter and dispose of its bacterial content. Neglecting special local conditions such as currents tending to form deposits, shallow rapids, etc., it has been demonstrated fairly conclusively that, should raw sewage be turned into a stream whose flow is not more than 2 to 2½ cu. ft. per second per each thousand persons contributing to the sewerage system, the supply of oxygen will be inadequate and a serious nuisance result. On the other hand, a flow of 6 to 8 cu. ft. per second per thousand contributing persons, will satisfactorily digest the organic matter of the sewage and the stream will be "self purifying." Another way of stating the above is that a stream will dispose satisfactorily of one-fiftieth of its volume of sewage, but not of one-twentieth. It is to be understood in the above that the possibility of putrescence is referred to in these figures and not bacterial purification. This "self purification" of the stream, as it is usually termed, is due to the oxygen dissolved in the water being available for the reduction of the organic matter. If at a given point, the amount of dissolved oxygen be tested for, in a stream receiving continuously, a volume of raw sewage, it will be found that there is a marked decrease in this constituent immediately after the addition of the sewage, and that even should the stream be capable of self-purification, the dissolved oxygen will only return to its normal amount at some distance down stream depending on the intensity of the pollution. Another factor in the so-called "self purification" is, of course, the dilution itself. If for instance a stream of sewage in which the chlorine content is 200 parts per million, is discharged into a body of water fifty times its volume, in which the chlorine content is 2 parts per million, the chlorine content of the polluted water would be 6 parts per million or a reduction by dilution alone of 97 per cent. There is no question that in so far as nuisance is concerned, dilution is a perfectly satisfactory method of disposal, providing the degree of dilution is sufficient. As regards the bacterial effect on the stream, this must be more closely looked into and the effect on water supplies considered. The element of dilution will itself result in a marked decrease in the bacterial content per c.c. Thus if sewage carrying 1,500,000 bacteria per c.c. be turned into 50 times its volume of water, in which the bacterial content is say 500 per c.c., then the bacterial content of the mixture would be a little less than 30,000 per c.c. In this case the bacterial content of the sewage has been reduced 98 per cent., but nevertheless the bacterial content in the diluted sewage is high as compared to ordinary surface water. However, in addition to this reduction by dilution, whilst the organic matter of the sewage is being digested and mineralized by the water bacteria, the original sewage bacteria are gradually dying out and disappearing. Being in suspension they settle out along with the organic matter to which many are attached. Light, low temperatures, and surroundings to which they are not accustomed all tend to reduce their numbers. River water is an unfavorable environment and the sewage bacteria whose home is the alimentary canal are unable to adapt themselves to their new environment and so die off. It may take some time to accomplish this and in this respect storage is of assistance. In fact the old idea that a swiftly running stream tended to purify itself in a shorter distance than did a slowly moving one is one of the popular fallacies regarding sanitary matters.

In Fig 1 is shown graphically the self purification of the Illinois River after receiving from the Chicago Drainage Canal a volume of sewage equal to one-tenth of its flow at that point. The river receives tributaries at points lower down, which increases this dilution, bringing it down finally to about 1 in 40 at Grafton just before the Illinois empties into the Mississippi. The chlorine content is of interest since it indicates the effect of dilution alone; the free ammonia content is a measure of the digestion of the sewage and it will be seen that its reduction is greater than could be attributed only to dilution. The decrease in the intensity of the bacterial content is also noticeable, the final reduction in the 15 days being about 99 per cent. Of course mere per centage results should not be given too great a prominence. What is essential is the question as to the probability of pathogenic bacteria contaminating a source of water supply. Where the reduction, however, approaches the above and since it is true that all surface waters are liable to contamination from other sources than the sewers of large cities or towns, it would appear reasonable to lay emphasis on the treatment of the polluted water with its comparatively low bacterial content, rather than on the raw sewage. In the former case the treatment would occur just before the delivery of the water into channels in which it is protected from further pollution whilst in the case of the sewage treatment, although the pollution of the supply from this particular source is safeguarded, the water supply may be subject to further pollution before finally reaching the consumer. A final point might be noted here and that is that the sewage treatment giving the required high bacterial efficiency is relatively much more expensive than a treatment of



Station	Period of Flow	Parts per million Chlorine ⊙—·—	Parts per million Free Ammonia ⊙- - - -	Bacteria per C.C. ▵——
Canal Lockport	0.0	124.5	10.90	1,755,000
DesPlaines R Joliet	0.1	41.5	4.22	744286
Illinois R Morris	0.9	24.5	2.46	445,000
" Ottawa	1.8	15.3	1.55	116,000
" LaSalle		17.5	1.05	94,000
" Henry	3.7	13.3	0.92	64,000
" Averyville		13.5	0.81	51,800
" Wesley		12.0	0.56	36,800
" Pekin	8.3	12.3	0.70	68,400
" Havana	9.8	11.2	0.60	23,100
" Beardstown	11.2	10.7	0.69	28,200
" Kampsville	13.9	11.3	0.66	33,700
" Grafton	15.1	9.8	0.46	21,000

Fig. 1—Self-purification of the Illinois River.

the polluted water which will accomplish the same degree of purification.

Sewage Treatment

Should it not be advisable to dispose of the raw sewage by running it into a body of water, then some form of treatment must be given the sewage before it is finally turned into the drainage channel. This treatment may vary all the way from rough screening, to remove the larger portions of the solid material, to a thorough preliminary and final treatment giving an effluent having a high degree of bacterial purity. In many cases a retention of the coarser materials will allow of disposal by dilution, in others a tank treatment for the further deposition of finer matter and the liquifying of certain organic matter in suspension is required. Again in addition to the tank treatment there may be required an oxidizing treatment of the tank effluent to prevent putrefaction and finally, in addition to the above, a high bacterial efficiency may be required, necesitating filtration and disinfection of the effluent.

Screening

Coarse screens (openings of 0.5 inches or more) are used in most sewage disposal works to remove the larger suspended matter such as paper, rags, corks, sticks, leaves, etc. In Europe somewhat finer screens have been required as the only step before disposal by dilution. At Cologne the sewage is discharged into the Rhine after being screened to a diameter of one-eight inch (0.12 inches). In America the United States government allowed the discharge of the sewage from the Passaic Valley sewer, after screening to not more than 0.4 inches, followed by sedimentation. Screening would materially lessen the possibility of a nuisance being created, but of course would have little significance from a bacterial standpoint.

Tank Treatments

Next to screening or straining, the simplest form of treatment that sewage receives is one of the tank treatments. In all of these the sewage is allowed to flow through a tank, its time of passage varying from 1 to 18 hours and its rate of flow from 0.1 to .01 feet per second. In all tank treatments there is a deposition of the suspended matter due to the low velocities, but there are practically four distinct types of tanks, differing materially in the biological action that is specifically encouraged. These types might be listed as Sedimentation, Septic, Imhoff and Hydrolitic.

Sedimentation Tanks

In the sedimentation tanks the object is mainly the removal by deposition of the suspended matter. To hasten this process, chemical precipitation may be used, in which a chemical is added to the liquid in the tank in order that a flocculent precipitate may form and so not only hasten the settlement of the suspended particles but by coagulating them cause the finer particles to settle out also. The deposition in the tank is termed sludge and its removal and disposal is one of the very difficult problems in this treatment. Since the sludge is mainly water it is difficult to handle, and since it may contain organic matter still capable of putrefying, its disposal in the neighborhood may cause a nuisance. In chemical precipitation especially, the sludge problem has been a very difficult one. The effluent from the tank is of course much poorer in organic matter and has also had removed from it all of the coarser suspended particles. It is thus much less likely to clog the pores of filters and contact beds by which it may have to be further purified. The action of sedimentation either with or without a chemical is only on the suspended matter. The organic matter in solution is not affected and hence the treatment does not give a nonputrefactive effluent. It can only be considered as a final treatment in cases where the effluent is discharged into a sufficiently large body of water. In chemical precipitation there is a certain amount of bacterial purification owing to the entangling action of the precipitate but its efficiency in this respect may be disregarded.

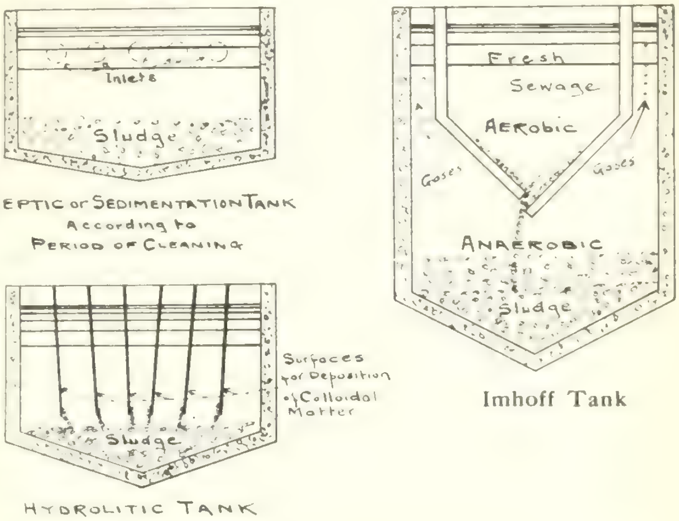


Fig. 2—Diagram of various tank treatments.

Septic Tanks

When the septic tank was first designed and for a number of years afterwards, it was hailed as a panacea for sanitary ills. In the first place it was expected to solve the sludge problem and it was also claimed that pathogenic bacteria were thereby eliminated. The process is distinguished from other tank treatments in that the tank is designed as a workshop for anaerobic bacteria and everything is arranged to foster their activities. There is no doubt that such bacteria have strong liquifying tendencies, and that a certain portion of the organic matter in suspension in the sewage, is liquified in the septic process and being in solution, is in a form much easier to deal with than in the form of sludge. However, a careful investigation of the septic tanks by the Royal Commission has shown conclusively, that from 30 to 60 per cent. only of the organic matter in suspension is liquified. Owing to the bubbling up of the putrefactive gases, much of the finely divided matter in the sewage is carried over into the effluent and hence, judging by the sludge content, the liquifaction seems to have reached a higher degree than is actually the case. A tank takes about three weeks to become thoroughly septic in its action and thus the distinction between sedimentation and septic tanks is the length of time between successive cleanings of the tanks. The construction, except in minor details, is the same, but a tank cleaned each month could not be considered as a septic tank. Their claim of efficiency in regard to pathogenic bacteria has not been sustained by investigation, and although it is in use as a preliminary treatment in many disposal works, in more recent works a different type of tank known as the Imhoff is coming more and more into prominence.

Imhoff Tank

The distinctive feature of the Imhoff tank is that the fresh sewage is not run into a receptacle in which all oxygen has been exhausted and where anaerobic bacteria are active. Instead the sewage flows in an upper channel in which aerobic conditions are undisturbed, whilst the organic matter in suspension settles out and drops down into a lower compartment in which all the liquefying activities of the septic tank are prominent. In fact the Imhoff tank is a double-decker, plain sedimentation above and septic action below. The sludge chamber, however, is somewhat deeper than is the case in the usual septic tank and hence the sludge removed from the bottom of the tank is less liquid than in the other tank treatments, and having been worked over by the bacteria for a long period of time is nonputrefactive and its disposal is thus much simplified. In fact the sludge has been dried in sludge beds close to habitations and the dried sludge has been placed as filling, etc., much as any earth or silt might be used. It is also claimed that the effluent being still in the condition of fresh sewage is more susceptible to further treatment by contact beds, sprinkling filters, etc., but this point of advantage over septic tanks is not as yet thoroughly established. It has been demonstrated, however, that the tanks may be operated without the creation of a nuisance in their immediate neighborhood.

Hydrolitic Tanks

In discussing sewerage it has been already pointed out that matter may become so finely divided, that although not properly in solution, it will not obey the usual laws of subsidence but will be precipitated if brought in contact with surfaces. Such matter is termed "colloidal" and its removal is especially aimed at in the so-called hydrolitic tanks. This principal is also active in contact beds but in the hydrolitic tank it is the physical removal that is of importance rather than the biological action which also takes place in the contact bed. These hydrolitic tanks differ from ordinary sedimentation tanks only in the fact that a large surface is exposed to the flowing liquid by hanging plates longitudinally in the tank. Upon these plates the colloidal matter is deposited and forming masses, flakes off and drops to the bottom of the tank. Diagramatic representations of sedimentation, septic, Imhoff and hydrolitic tanks are shown in Fig. 2. All of these aim at the reduction of the suspended matter both organic and mineral, whilst what might be termed the secondary treatments, such as contact beds, and filters, are designed to reduce the organic matter by processes of nitrification to simple mineral salts. The organic matter in solution is much better adapted to treatment by these secondary processes and hence the aim in all tank treatments is to reduce the suspended organic matter as much as possible. In the secondary treatments the aim is to bring oxygen into intimate contact with the organic matter and expose it to the activities of the nitrifying or aerobic bacteria.

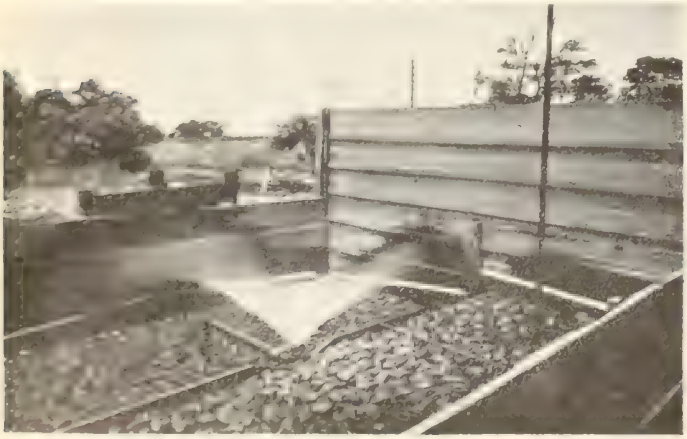


Fig. 3—An experimental sprinkling filter.

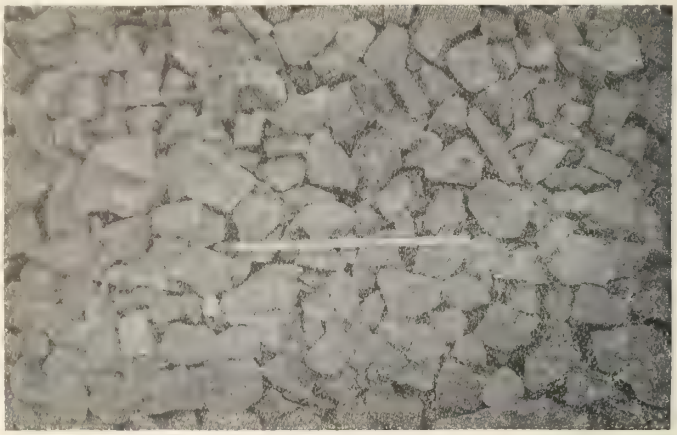


Fig. 4—Filling of contact and sprinkling filter beds.

Contact Beds

In this treatment coarse material ½ to 3 inches in diameter is placed in a tank and the sewage is allowed to come in contact with it for a given length of time and is then drained off. The bed is then allowed to stand a certain period, when a fresh dose of sewage is run into it. In this way the large number of surfaces exposed become the home of aerobic bacteria who attack with great vigor the organic matter brought in intimate contact with these surfaces and thus the organic matter is nitrified. Should sewage be run continuously in to the bed there would be no opportunity for renewal of the consumed oxygen and aerobic conditions would cease permanently. But in the straining off and resting period the oxygen in the pores of the filter is renewed and the organisms in the body of the filter are ready to attack the next dose of raw sewage and oxidize the organic matter. In many cases there are primary and secondary contact beds, the materials of the first being coarser than those in the second. Experience would seem to show that a double contact is more effective than a single contact at half the rate. Contact filters, especially double contact, ones, have proved very satisfactory in giving nonputrescible effluents. The rate of operation is from 350,000 to 450,000 gallons per acre per day and thus the area required is relatively large. To enable higher rates and consequently smaller areas to be used the sprinkling or trickling filter has been developed. Contact beds are more compact and will work under a less head. They are also more inconspicuous and are productive of less odor and thus lend themselves to small installations for institutions or private houses; but in the larger installations the newer designs call for trickling filters as the secondary treatment.

Trickling Filters

The low rates required in contact beds led to the development of a method that would allow of a more continuous flow and yet not interfere with aerobic action. Experiment has finally resulted in a filtering process in which the filter material is quite coarse and upon which the sewage is fed in a fine spray. In place of passing through the filter under a hydrostatic head it trickles over and around the filling material allowing air to be carried continuously down into the body of the filter thus maintaining aerobic conditions at all times. These trickling filters have proved very successful in producing a nonputrescible effluent at rates of from 1 to 2 million gallons per acre per day. A very good idea for a sprinkling filter may be obtained from the photograph of the experimental filter at Philadelphia shown in Fig. 3. Filters of this type have been installed as the secondary treatment in Columbus as the result of a very careful series of experiments embracing all the standard methods of treatment. The filling material of both sprinkling filters and contact beds may be broken stone, gravel, clinker, trap or in fact any hard substance that does not readily disintegrate under the action of water. The photograph in Fig. 4 gives a good idea of the size and nature of the filling material. The effluent from sprinkling filters requires, at times, a period of sedimentation to settle out the precipitate carried through, but even with this additional treatment the method is less costly than is that of contact beds and the results are equally satisfactory.

Intermittent Sand Filtration

In the process of intermittent filtration, either prepared or natural beds of sand are underdrained and the sewage allowed to filter through periodically; that is there is a time of filtering and then a time of resting. The biological action is similar to that in contact beds but the material is much finer; much slower rates are possible (50,000 to 100,000 gallons per acre per day) and hence the bacterial purification is markedly greater and the effluent is chemically somewhat purer. The treatment is more costly than either contact beds or sprinkling filters especially if sand deposits do not occur in the neighborhood. It also requires a much larger area for its operation.

Disinfection

In the above methods of treatment the effluent obtained may be of a nonputrescible nature and thus be disposed of without the creation of a nuisance. But intermittent sand filtration is the only one of them that has any bacterial significance. In this latter, with careful oversight, the bacterial purification may be as high as 99 per cent. and the actual bacterial content of the effluent be under 10,000 per c.c. But in the effluent from sprinkling filters, contact beds, sedimentation, septic or Imhoff tanks the content will be so large, that although the percentage reduction from the numbers in the raw sewage is considerable in the first two treatments, none of them can be considered as having bacterial significance. Rideal quotes experiments by Pickard, at Exeter, which show that typhoid bacilli may persist for two weeks in a septic tank and that contact beds only effects a 90 per cent. reduction of these organisms. Thus when bacterial purity is required the effluent from all these treatments, tanks, contact beds and sprinkling filters must be subjected to some further process dealing directly with the organisms.

There are many agents for this purpose, but commercially the field narrows down and it would seem at present, that as is the case in water disinfection, the use of hypochlorite of lime is to be recommended. Since the organic content of either the raw sewage or of the effluents is higher than is that of ordinary surface water, a greater amount of the chemical is needed Phelps in his report on the disinfection of sewage and sewage filter effluents (U.S. Water Supply paper No. 229) states that ten to fifteen parts per million of available chlorine is required for septic sewage, four to six parts for crude sewage and three to four parts for trickling filter effluents. Taking commercial bleaching powder as containing 35 per cent. of available chlorine, this would mean that 300 to 450, 120 to 180, and 90 to 120 pounds of bleach would be required in the treatment of each million gallons of septic effluent, crude sewage and trickling filter effluent respectively. There is no question but that disinfection both in regard to water supply and sewage disposal is one of the most important recent advances in sanitary science. It points the way to a much cheaper and more effective method of obtaining bacterial purity from suitable effluents. But the safety to be expected from the disinfection of raw sewage on a large scale is yet to be determined. The reasonableness of passing the storm water of a combined system directly into the drainage channel and disinfecting the dry weather flow, must be carefully considered before too much reliance is placed upon such a treatment, as an absolute safeguard to a public water supply.

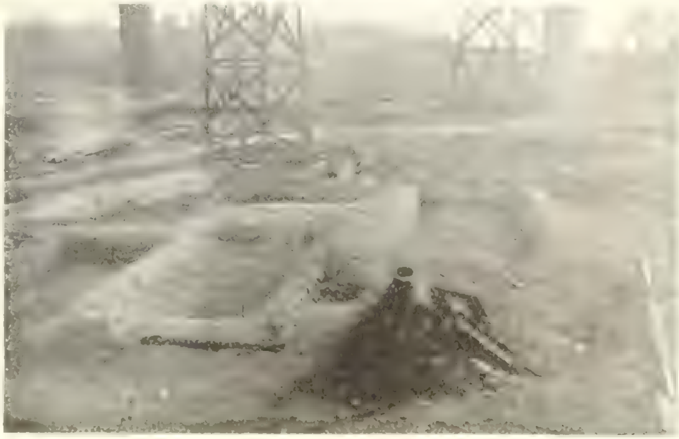


Fig. 5—Sludge drying in earth lagoons.

Summary

In the water carriage system the liquid collected must ultimately find its way into the usual drainage channels and join the outflow of other surface waters. It may be treated before such disposal takes place or, as in the majority of cases in this country at the present time, it may be turned into the drainage channel in its "raw" state. Owing to the fact that in some cases nuisances and outbursts of disease have undoubtedly resulted from this practice, there is a very determined agitation to prohibit entirely the disposal of all sewage in its raw state. That this agitation will result in good no one can doubt, but at times it would appear that the advocates of "total prohibition" are apt to ride their hobby beyond the limits of common sense. Although "local option" is not to be thought of in a case where it is the next municipality that must pay the piper. Nevertheless it would appear that each case should be dealt with by an impartial board of experts representing either Federal or Provincial authorities, rather than that all cases should be made to rigidly conform to a general law. In some cases disposal by dilution is and will continue to be a perfectly legitimate method of treatment. In other cases, tank treatments alone or as a preliminary to contact beds, trickling filters or disinfection or a combination of [illegible] be objectionable. That each municipality should so dispose of its sewage, that no nuisance will result, is obvious but the degree of bacterial purification to be exacted must depend on local conditions and these are difficult to provide for in a law rigorous enough to cover the cases that really need restrictions. It would appear that a board should be created upon which, both the common sense and a practical knowledge that might be considered as belonging more especially to the engineer, and the visions and exact knowledge of the pure scientist, shall each be represented. To the board should be given power to deal with each local situation in the interests of the community at large. This is the only satisfactory method of dealing with a very difficult problem.

Prospective Opportunities for Highway Engineers

THE construction of good roads has become one of the important interests of the American Republic. While the question is making head in Canada, we are as yet not fully seized with the importance or necessity of easy intercommunication by roads. The bearing of good highways on the economic, moral and educational welfare of a nation was ably discussed by Mr. Charles Henry Davis, C.E., President of the National Highways Association, before the Minneapolis convention held during the present week. As the point-of-view from which the speaker approaches the subject is likely to prove of interest to readers of the Contract Record, we give below some portions of his excellent address.

Methods of intercommunication, up to the limits of apparent needs, are essential to the well-being of any people. People, like water, stagnate if confined to one locality. They must run and play, like the brook itself, or become sluggish and dull—to themselves as well as to others. Hence before the coming of steamboats, railroads, the printing-press, and electricity, roads were built by the older nations so that their peoples could move. Roads were the only means they had of intercommunication. But we came to be a nation when these modern methods of connection and communication were being perfected. As these means were more rapid and as our country was so large, their development pushed to one side the building of roads. We were too busy for road-building and our need therefore was not then so apparent. But now we are, as a nation, awakening to the lack of our forethought, the pressing necessity and the vital importance of road-building. We are probably now spending directly and indirectly over $500,000,000 per annum on the roads of the country. And yet we have less than ten per cent. of our 2,300,000 miles improved —or with the semblance of improvement, such as it is. What shall we spend to make them all good roads, and to maintain them? No one can tell. No one can foresee. But it is safe and conservative to predict over $1,000,000,000 per annum during the next twenty five years—or an investment exceeding that on our steam railroads. And then we shall have made only a beginning.

It is estimated that the present average haul is a little under ten miles and that the cost is about twenty-three cents per ton per mile. This cost should not exceed eight cents per mile on a good road. In other words, at least one dollar and a half should be saved on every ton moved on our highways. Thus the total saving from good roads staggers the imagination. Our railroads carry two billion tons of freight per annum. If, instead of the above estimate, we assume that only an equivalent tonnage passes over our highways, then the saving per annum would be $3,000,000,000 on a system of good roads. The probabilities are that the saving would be far greater.

After pointing out the enormous increase in the value of farm lands that would accrue as a result of a general improvement in highways, the speaker gives an exceedingly interesting table which establishes a direct connection between bad roads and illiteracy, and sums up their bearing on education thus:—We cannot have good schools in the rural districts without good roads. Good schools are impossible of attainment except we have good roads. And we must have good schools. If education means liberty, and if poor roads mean illiteracy or worse, have we a right not to build good roads, even if they would not pay for themselves well within the generation which builds them?

And of equal importance—our people cannot get "back to the land" unless we have good roads. They must get back for us to live as a nation!

The president brought his paper to a close with this striking conclusion. Is it not apparent that the opportunities are unlimited? In being unlimited there is a serious side to it! Will all the educational institutions, including the National Government, be able to educate highway engineers rapidly enough to supply the need therefore? We think not. Decidedly not! Therefore the greater the facilities offered for such education the better for good roads—whether these facilities be private or public, state or national. We cannot obtain, in time for our needs, the education and therefore the knowledge we need to properly and economically build the good roads of the coming generation. The opportunities for the highway engineers are therefore unlimited in or out of a National Highways Department.

The Municipal Journal quotes from the report of the Board of Water Commissioners of Kingston, N.Y., and comments as follows:—"In the bitter cold weather a great many of the mains are within the frost line and it is necessary to have the water running in order to prevent the pipes from freezing. In view of the physical defect in the original installation of the system (laying the mains in too shallow trenches) the Board has not enforced the rules against allowing the water to run to waste in bitter cold weather, but has considered that it was necessary. Should the time ever come when the supply is not sufficient to meet the needs of the city, and it is necessary to meter all residences, it will also be necessary to lower the mains over the greater part of the city, at an expense too great to contemplate in this report. . . . . To meter the entire city would cost approximately $80,000, and would require lowering the mains in addition."

We do not recollect ever having seen in any other report the approval by water commissioners of the too common practice of consumers in unmetered cities of allowing water to flow during cold nights to prevent the freezing of service pipes and house plumbing which are improperly laid and protected.

Systematically arranged bills of quantities duly priced (whether work has been secured or not) form excellent data for making future estimates.

New Barracks, Long Branch

TENDERS have just been called for the installation of a complete waterworks and sewage disposal system in connection with the new barracks which the Ontario Government will erect at Long Branch, Toronto. Tenders have also been called for certain of the buildings. The new barracks will be situated some 10 miles west of Toronto on the Lake Shore Road, and just west of the Etobicoke River. The total area of land purchased for this purpose includes some 500 acres, which, in addition to the barracks buildings, will include manoeuvring grounds, the existing rifle ranges, etc., and leave considerable space for future extensions.

The general plan of the layout of this area is shown in Fig 1 of the accompanying diagram. The buildings themselves will be arranged, as shown, around a large quadrangle to be known as the Barracks Square. The functions of the various individual buildings may be understood by referring the following legend to the figures indicated on the diagram.

1, guard room, offices and store building; 2, drill hall; 3, riding school; 4, water tower with fire station under; 5, 6, 7 and 8, barrack buildings for 780 men, each; 9, officers mess and attached officers quarters; 10, 11, 12, 13, 14 and 15, two married officers quarters, each; 16 and 17, two commanding officers quarters, each; 18, permanent medical officers quarters; 19, hospital; 20, proposed Protestant chapel; 21, proposed Roman Catholic chapel; 22, sewerage pumping station; 23, central heating plant; 24, officers stables; 25, infirmary; 26, 27, 28, 29, 30 and 31, stables; 32, 33 and 34, quarters for one warrant officer and eight married men, each; 35, sewage disposal works; 36, flag pole.

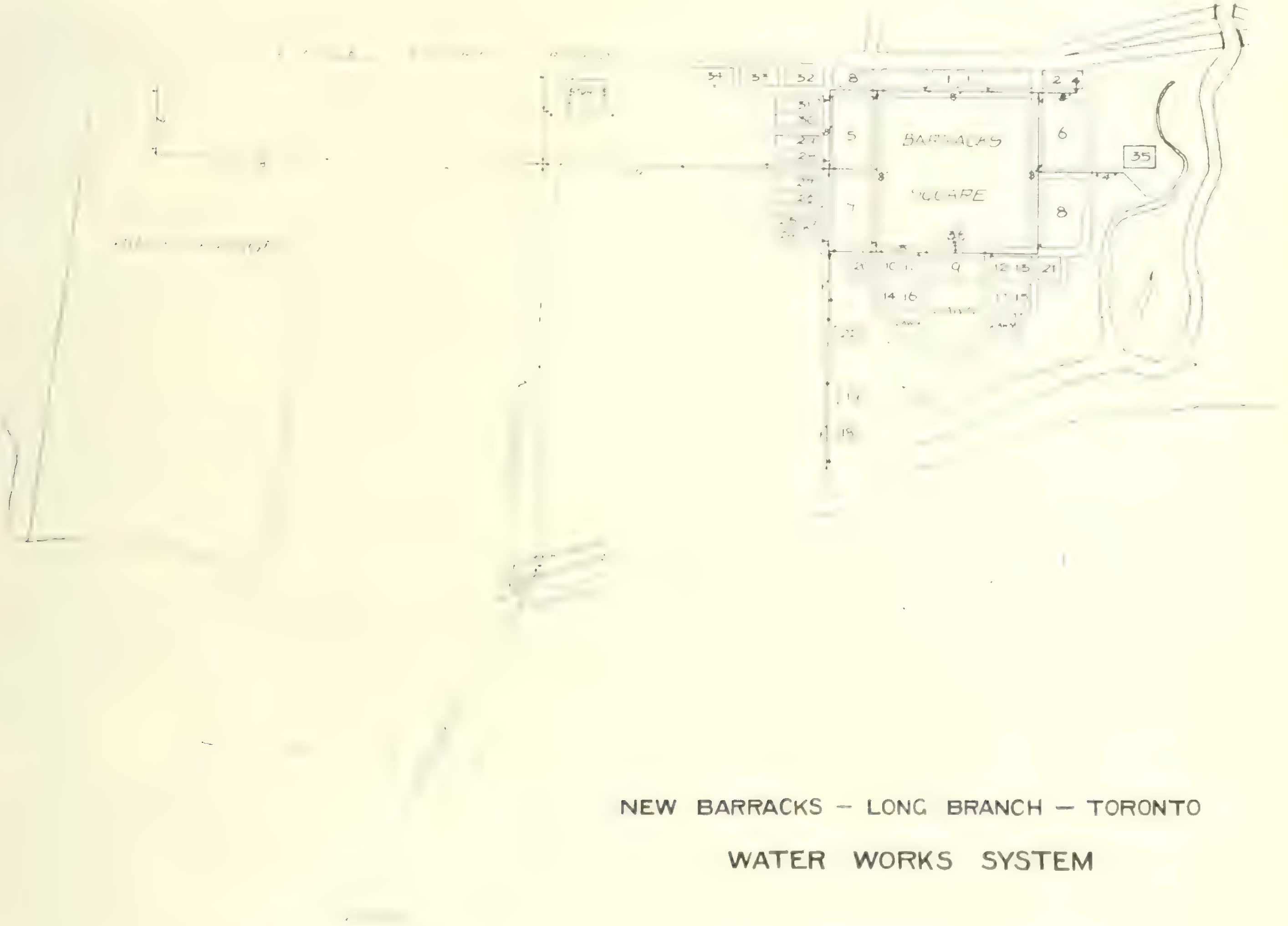


Fig. 1—New Barracks Grounds at Long Branch, showing plan of Water Works intake and distribution.

The completion of these buildings will be spread over a number of years, but tenders have already been called for the erection and equipment of one large Men's Building, in addition to all the necessary water purification plant and sewage disposal equipment.

The waterworks distribution and purification and the sewage disposal will represent one of the most complete and modern installations of the kind anywhere in Canada. The intake screen will be located some 2,000 ft. from shore as shown in the general sketch. The pump house is located at the shore line and includes a concrete walled well, a pump house proper, filters and reservoirs. The intake pipe is 12 in. in diameter and is provided with flexible joints every 100 ft. Protection of the pump house buildings is ensured by a reinforced concrete breakwater dam which extends out into the lake in the form of three sides of a square. The cross section of the dam measures 10 ft. high x 6 ft. 6 in. in thickness at the bottom and 4 ft. at the top.

From the pump house the water is elevated to a tower shown on the diagram as 4. This tower is one of the most interesting features of the barracks. It will be located on the highest point of land on the property, and will itself rise 150 ft. in total height above the ground level, on a 51 ft. octagonal base. The tank will be constructed of sheet steel varying in thickness from ⅜ in. at the bottom to ¼ in. at the top, constructed in the form of a vertical cylinder with a hemispherical bottom and measuring 25 ft. in diameter x 44 ft. over-all in height. The steel work will be encased in stone masonry, which, when completed, will appear as in Fig 2 herewith. The cross-section of the base, which will be a regular octagon, is also shown. This tower, with its handsome exterior and commanding elevation will be one of the show pieces of the barracks, and will be an outstanding feature visible for miles around.

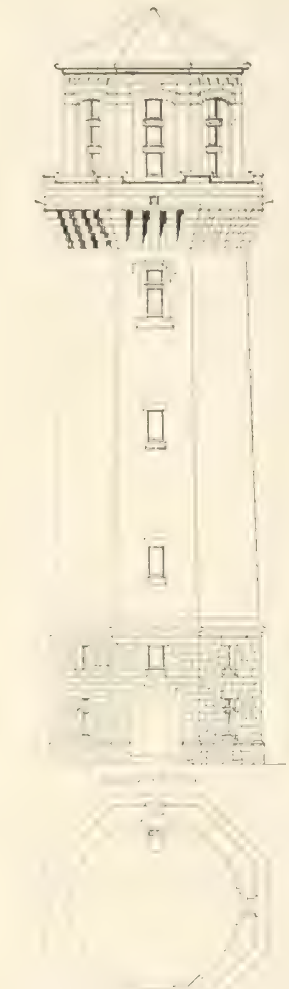


Fig. 2--Completed Water Tower.

A complete sewage purification plant is also being installed. The sewage will pass first through a screen chamber to sedimentation tanks, of the Imhoff type, of which there will be six in number with a capacity of 3,000 cubic feet each. The sediment will be drained periodically, to the sludge beds by an 8 in. pipe, while the liquid sewage will pass for further purification, first to the spraying filters, which are all under-drained, and thence to the disinfecting chamber where it will be treated with calcium hypochlorite. Finally the purified effluent will be discharged into a pair of humus tanks, 240 cubic feet capacity each, whence it will pass to the river.

Another feature in connection with the civil engineering work will be the construction of two viaducts over ravines which cross this property. Each viaduct will be about 300 ft. in length, of concrete construction, and of a width to accommodate horse and motor vehicles as well as an electric railway line. Semicircular openings will be left under the viaducts for the discharge of water which has a considerable volume at certain seasons of the year.

As already stated, the system of water purification and sewage disposal is being installed according to the latest and most approved engineering practice. The entire work, including the viaducts was designed by Messrs. Chipman & Power, civil engineers, Toronto, and will be carried out under their supervision. The estimated expenditure for water works and sewerage will approximate $200,000.

Thirty thousand dollars is the cost of a cleansing plant which the city of Edmonton will construct at the First street outfall of the sewer system. The plant situated beyond the end of the east end bridge on the north side of the river will be extended so as to take

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A deep-water canal is proposed to connect the Firth of Forth and the Firth of Clyde, which will eliminate a 400-mile route around the dangerous north coast of Scotland. This canal, which will cross the most thickly populated part of the country, will cost about $150,000,000. The present barge canal has an average depth of 9 to 10 feet.

The Water Department of Houston, Texas, after experimenting for several years with service pipes in an effort to reduce as far as possible the destruction by electrolytic action which had been going on, as a last resort determined to try lead lined pipe. Previous to this, galvanized pipe which had been used had to be replaced in a large percentage of the services throughout a certain section of the city, in some instances twice a year. The superintendent stated, in his report of 1912, that "the use of lead lined pipe has proved so effectual after a thorough trial that it is not probable we will experience any trouble of this nature after the old pipes have been removed in the electrolysis districts."

In connection with the problem of keeping silt out of the irrigation canals and in cleaning the distributing system, it is interesting to note that in planning the irrigation works from the Euphrates, special attention is being given to gates at the head of the canals and arrangements such as to cut out the water entirely in time of floods and thus prevent the silt-bearing waters from entering the canals. It is stated that the heavy silt in the flood waters of the Tigres and Euphrates caused the destruction of the ancient canal systems on these rivers.

Limitations in the Use of Bituminous Carpet Surfaces

By A. W. Dean, M. Am. Soc. C. E. in Good Roads.

A bituminous carpet surface is well defined as "a bituminous surface of appreciable thickness formed on top of a road crust by the application of one or more coats of bituminous material, with gravel, sand or stone chips added." Such a carpet is not formed by the use of oil emulsions, consequently, emulsions will not be considered in this discussion, nor will a crust approximating two inches in thickness be considered, inasmuch as when a coat or blanket is made of such thickness, it ceases to become a carpet, but rather becomes an integral part of the road crust or pavement.

Limitations in the use of bituminous carpet surfaces are governed by three principal features. First, character of the road crust under the carpet. Second, character of the carpet itself, including both the bitumen and the grit or such material as is applied with the bitumen. Third, character of traffic to be sustained. Taking these in their order named, let us first consider the character of the crust.

This should be of such a nature and on such foundation that the weight of the traffic will be thoroughly sustained without any aid whatever from the carpet. For average traffic on suburban roads, a water bound macadam road on a suitable and sufficient foundation is an ideal crust upon which to apply a bituminous carpet, regardless of the nature of the bitumen used to form the carpet. Under some conditions, a cement concrete crust is excellent and preferable to water bound macadam, in that it has more stability and will withstand a greater load. A concrete crust, however, does not appear to hold a carpet of an asphaltic nature as well as it holds one formed by the use of tar, the adhesion being apparently less with the former than with the latter material. A crust of good gravel, thoroughly compacted, is good under restricted traffic conditions, but it does not appear to hold a carpet formed by the use of heavy asphaltic or tar binders, unless the carpet is made of such thickness that it becomes a part of the road crust. Heavy binders as referred to herein are intended to mean binders that require heating to a temperature of at least 180° F. in order to permit satisfactory application. A bituminous carpet on a gravel road appears to be successful under comparatively light traffic if a bitumen is used that does not require heating to a temperature above 100° F. before application.

A carpet formed by the use of any material on a dirt road is of no value whatever, as it breaks up under any kind of traffic and very soon ceases to be a carpet.

Character of Bituminous Carpet

Continuing to the second principal feature, namely, the character of the bituminous carpet, we have again a very important factor. The kind of bitumen used and the method under which it is applied, the kind and amount of grit used, and the character of the grit, each and all have a very decided influence on the limitations of economical use. Experience has shown that a carpet must be uniform in thickness, and in order to be so the bitumen and grit must each be spread uniformly, and in order to spread the bitumen uniformly experience has shown that it must be distributed by means of pressure applied in some manner, either by introducing air or steam pressure directly into the tank in which the bitumen is contained, or in securing pressure by means of a pump of some form. Experience has demonstrated also that where it is de-

Road with bituminous carpet surface built under supervision of the Massachusetts Highway Commission at Warren sired to make a carpet requiring the bitumen to be applied at the rate of ½ gal. per sq. yd., uniformity is more successfully obtained by applying the bitumen in successive layers of approximately ¼ gal. per sq. yd., each layer of bitumen being covered with grit before the succeeding layer is applied.

The grit used for covering the bitumen should contain no clay or loam, and if the traffic to be borne is a mixed traffic, with steel tires predominating, it appears that the best and most lasting results are obtained by using a mixture of coarse and fine material, the coarse material consisting of tough pebbles, or stone broken to pebble size (approximately ½ in. in diameter), mixed with material of a finer nature, such as sand or a coarse grade of stone dust. Such mixing is better accomplished if the two grades of grit are applied separately in forming the blanket, that is, the coarser material being applied first and immediately followed by the finer material. Such method of application appears to give a firmer carpet that will withstand a greater amount of steel tire traffic than will a carpet formed by the use of either coarse or fine material alone. If a carpet is to carry a traffic consisting largely of automobiles, the coarser material does not become as necessary, although it appears to be preferable.

The kind of bituminous material that it is preferable to use in a carpet is still a debatable subject, particularly as to whether tar or asphalt products are preferable, and in the use of asphalts, whether a heavy asphalt requiring high temperature (200° F. or more) before application is preferable to one that does not require such high temperature. It has been the experience and observation of the writer, however, that the asphalts requiring high tempertaure before application give better and more permanent results under a mixed traffic than do the lighter asphalts. By mixed traffic the writer means a combination of trucks, automobiles and heavy and light horse-drawn vehicles. A carpet formed with a heavy asphaltic material, however, does not withstand traffic consisting largely of heavy steel tired vehicles, the effect of such being to cut the blanket and cause it to crumble and to soon disappear from the surface.

Character of Traffic

The third principal feature, namely, the character of traffic, must necessarily be considered in connection with the second principal feature, already discussed. In fact, neither one of these three features hereinbefore mentioned can be discussed entirely by itself, as each is dependent somewhat upon the others. With a suitable road crust to sustain a bituminous carpet, traffic is an extremely important factor in determining what type of materials to use for such a carpet. The amount, type and weight of vehicles must necessarily be considered. It has been demonstrated that a tar carpet will carry economically 100 automobiles per day per foot in width of roadway, together with a horse-drawn traffic of 15 vehicles per day per foot in width of roadway. On the other hand, a similar tar carpet failed under a traffic consisting of 20 heavy, horse-drawn, steel tired vehicles per foot in width of roadway per day, with only 8 automobiles per foot. This clearly demonstrates that a tar blanket is not suitable and should never be used to sustain heavy horse-drawn traffic, but is suitable and economical in carrying automobile traffic. Inasmuch as no particular wear appeared to be caused by the above mentioned automobile traffic, it is safe to assume that a much larger traffic could be economically carried. Records kept by the writer show that what has been stated above regarding the tar carpet is true also of the heavy asphaltic oil carpet. Failures that have occurred under the writer's observation with a heavy asphaltic oil carpet have occurred where the ratio of the number of automobiles to the number of horse-drawn vehicles was not any greater than two to one, and if the horse-drawn vehicles are of the heavy two-horse type, with narrow tires, no amount of automobile traffic appears to be sufficient to counterbalance the destructive effect

Typical road with a bituminous carpet surface as built under the supervision of the Massachusetts Highway Commission—two ½-gal. applications of heavy asphaltic oil applied by the use of a pressure distributor.

of 15 heavy horse-drawn vehicles per foot in width per day.

The writer is of the opinion that it is not wise at the present time to state general positive conclusions regarding limitations in the use of bituminous carpet surfaces. Such surfaces have been in use in this country only about four years, and the character and quality of the bitumen used at various times and in various places are so unequal, and the character of traffic over the highways is and has been changing so rapidly, that the results of experiments and observations have been variable. Positive and definite conclusions as to limitations can be drawn only after careful observation through a period of years, keeping a record of the kind and quality and amounts of material used in the carpet, and the approximate weight of vehicles passing.

Efficiency and Economy in Reinforced Concrete Design

Mr. John A. Davenport, A.M.Inst.C.E., read a paper on the above subject at a recent meeting of the Concrete Institute in London.

The question of economy in reinforced-concrete design, said the author, might be discussed with regard to : (1) The engineering structure, (2) the architectural structure, and the two sets of conclusions might or might not coincide. The completed engineering structure was a skeleton frame, without any architectural finishes, embellishments, fittings, etc.; while the completed architectural structure was the engineering structure made ready for use and presentable to the eye by the addition of finishes, fittings, embellishments, etc. There were, of course, certain structures such as retaining walls, bunkers, harbour works, etc., which are engineering structures purely and simply, and could not well be considered from an architectural point of view. But it was the object of the paper to deal chiefly with the structures composed of beams, columns, slabs, and walls, which came under the head of architectural structures. The most economical reinforced concrete engineering structure would have a certain arrangement of slabs, beams, columns, etc., with definite percentages of reinforcements, such arrangement and percentages having been determined, with due regard to the loading, with a view of producing the cheapest possible skeleton structure. This result would probably be attained by keeping the slab thicknesses small by the introduction of beams, by keeping beams deep and narrow, and by having the size of columns (probably all different) just sufficient to carry the loads. The adoption of such a scheme would result, as already stated, in the most economical engineering points from an architectural point of view, they might find the nett results economical in some cases and very uneconomical in others. Generally speaking, it was economical to reduce the thickness of the slabs by introducing beams and keeping the spans small. Now, it often happens that beams running across ceilings required special finishes, cornices, etc., and the amount saved on the engineering structure might be much less than the extra cost of architectural finishing. The adoption of uniform column sizes might be more economical ultimately, for the same reason. Again, deep and narrow beams were, generally speaking, most economical from an engineering point of view; but they did not conduce to efficient lighting and ventilating, and it might cost more to get these necessary properties than the amount saved on the skeleton structure.

In order to design economical reinforced concrete structures many factors had to be considered, some of which varied in all cases, but there were three fundamental points which influenced all structures in the same way, and these were: (1) The effect of beam section on economy; (2) the effect of percentage steel on economy; (3) the effect of lay-out or arrangement of beams, columns, etc., on economy.

In dealing with the first factor, the relative economies of singly reinforced T beams and singly and doubly reinforced plain beams, as regarded the ratio of breadth to depth, were discussed. The meaning of the second and third factors being self-explanatory were not further explained.

The total cost of any reinforced-concrete structure, whether a single slab, column, a whole floor, or a complete frame, would be the sum of the total costs of the three items—concrete, steel, and centering—and these, in their turn, would depend upon the unit costs. Now, these unit costs would vary for different parts of the one complex structure, but not for any single member; so that while a mathematical expression for a single member was possible, it would be impossible, owing to the very large number of variable quantities involved, to deduce a mathematical general expression for all classes of structure, simple and complex. Any attempt to deal with the subject of economy mathematically could only lead to ambiguity and vexation. It was, however, possible to deal with the subject by taking different arrangements, percentages, etc., and by calculating the cost of the various items, the required totals could be obtained by summation. That method appeared at first sight to be rather formidable, but by a suitable arrangement of the work it would be found that the difficulty is more apparent than real.

The conclusions from Tables I., II. and III. of the paper might, said the author, be summarised as follows:

(a) Reinforced concrete T beams, correctly designed, with the total depth three times the breadth of web, are more economical than any other section for all values of unit cost and loading.

(b) For plain beams, reinforced in any way whatever, the most economical ratio of depth to breadth is 3 for all values of unit cost and loading.

(c) For singly reinforced plain beams, the most economical reinforcement percentage runs from 1 to 1.2 for all values of unit cost and loading.

(d) For doubly reinforced plain beams the most economical reinforcement percentage is 1, with equal tension and compression steel, for all values of unit cost and loading.

(e) Plain beams doubly reinforced [illegible] in more economical than similar beams singly reinforced, the relative economies depending upon the values of unit cost and ratio of depth to breadth of section, but not to any appreciable extent upon the loading.

The foregoing conclusions were quite independent of any economies effected by adopting uniform sections throughout a design.

The results of Tables IV. and V. were summarised by the author as follows:

(f) For ordinary values of unit cost square columns, helically reinforced, are most economical of cost when the diameter of lateral is small, the pitch of lateral is 0.2 the breadth of core, and the percentage longitudinal steel is high.

(g) Increased economy of cost will result from the use of longitudinal reinforcement having a lower yield point than ordinary mild steel, provided such material be cheaper than mild steel.

(h) The greatest economy of space is obtained by using large diameter laterals, pitched at 0.2 the breadth of core, and a high percentage of longitudinal reinforcement.

Summarising the conclusions drawn from the remaining tables the author said:—

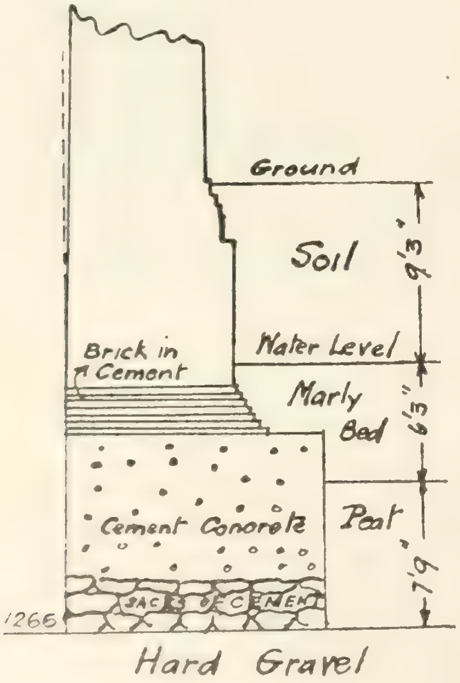
(i) A rational arrangement of slabs and beams supported by columns is more economical than slabs supported by beams only.

(j) A low-percentage slab reinforcement is more economical than a high percentage.

(k) A thin slab is more economical than a thick slab.

Underpinning Buildings*

The recent discussion as to the safety of St. Paul's Cathedral, London, with particular reference to the projected tramway tunnel in its vicinity, has reawakened interest in the subject of the shoring and underpinning of buildings, the foundations of which are not carried upon a solid substratum. The following notes with reference to the trouble that arose in connection with the foundations of Winchester Cathedral and to the manner in which the foundations were strengthened will therefore probably be of interest.



Winchester Cathedral was built upon a soil of compressible loam overlying a layer of peat 7 feet thick, which rests upon a hard bed of gravel. When the main portion of the Cathedral was built, water was encountered on digging for the foundations and as no method was then known of getting the foundations down to the solid bed of gravel, the footings were laid upon a raft of beech tree trunks. In the course of time the peat yielded, and as the settlement was unequal in different portions of the building serious cracks developed and some stones fell from the vaultings. Attempts were made to underpin the walls on to the hard gravel, but as soon as the peat was excavated, the water welled up from the gravel and could not be withdrawn except at great expense. The architect, Mr. T. G. Jackson, R.A., then consulted the well-known engineer Sir Francis Fox, who suggested that a diver should be employed for laying the lower courses and that underpinning should proceed in sections. The suggestion was carried out with great success; the diver laid sacks of concrete bonded together for a depth of about three feet; this sealed the bottom and the peat at the side, so that the water could then be pumped out of the hole. A layer of concrete was then laid as shown in the diagram, blocks 9-in. x 12-in. x 2 ft. being found more satisfactory than loose concrete; bricks in cement were then laid up to the existing walls which were carefully shored up. Underpinning was carried out in this manner for sections 4 ft. 6 in. wide, each section taking about one month.

This procedure was quite satisfactory, but funds were insufficient to underpin the whole building, so it was decided to underpin only the exterior walls, the gable walls being chained back to the side walls by rods and girders. As an example of the urgent necessity for the work and of the great care which was necessary in carrying it out, we may mention that the South Transept wall, 120 ft. high, was 4 ft. 6 in. out of the perpendicular.

All the cracks in the building were filled in with stone blocks and grouted with cement by means of the Greathead grouting machine. This machine is of great value in strengthening churches and old buildings. The machine was originally invented for the building of the tube railways; the sand, cement and water are mixed up and the mixture is blown through a flexible tube with a nozzle at is end, thus filling up any cracks and rendering the structure monolithic.

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* Ewart S. Andrews, B.Sc., in The Engineering Review.

FIFTY million dollars is the estimated possible cost of the new Welland Canal, operations upon which are to be commenced shortly. Contracts are to be called immediately for the first section of the work, beginning at the Lake Ontario end. The locks in the new canal will be 800 feet long by 80 feet wide. At the commencement there will be a depth of 30 feet on the sill, but this may be increased later to 35 feet.

Oxyhydrogen-flame working under water is said to be accomplished successfully by means of a special form of burner recently invented. This burner consists of an ordinary oxyhydrogen burner with the addition of a bell or hood shielding the gas orifice from the water, and a compressed-air supply. A Heckt, of Kiel, Germany, is marketing the apparatus, and also carries out subaqueous metal-cutting work. Information from him tells of successful demonstrations where a bar of iron 2½ in. square was cut through in 30 sec. at a depth of 16 ft. under water, a 12-in. slot was cut in 13-16 in. plate in 1½ min., etc.

Tests For Fireproof Construction

Increasing Necessity for Care—Testing Flooring and Wall Material--Wood Tests—Results of Experiments

A LEADING daily asserted recently that the destruction of fire in Canada had reached the appalling sum of one-sixth of the total daily production. An enormous loss surely and yet a loss, which greater care in the selection of building materials and a more thorough investigation into their fire-resisting qualities could to a very large extent obviate. The regulations regarding what is called fireproof construction, as adopted by the city of Toronto last April are practically the same as those of the city of New York. These regulations are generally considered quite stringent enough, in fact as pointed out in the Contract Record of April 30, might even be relaxed in regard to outside columns.

But something more than regulations is required. In every branch of building and constructional work, new products of unknown fire-resisting properties are being placed upon the market, as substitutes for the old standard builders' supplies—brick, stone, wood and plaster. In face of the increasing scarcity and cost of some kinds of building material, it is well that the production of good substitutes should be encouraged, and yet, that this may be done with perfect safety, it is absolutely necessary that the new compositions should be thoroughly tested. Firms manufacturing in Canada and United States may furnish certificates from the testing institutions of the latter country as to the fire-resisting qualities of their output, but this is not satisfactory and is an inconvenience and source of expense to the Canadian manufacturer. An American firm desirous of placing a new fireproof flooring upon the market in Toronto found out two things: first, that the certificates which it produced were not acceptable, and second, that there was no provision here for an economical test of their goods and was forced to ask Fire Chief Thompson to attend a specially arranged test of their flooring at Columbia.

In view of the growing interest in the prevention of loss by fire and the constant necessity for care, it might be a real economy for the city of Toronto to establish a fireproof testing department. What would be of more use probably would be the establishment of such a department in connection with the Faculty of Applied Science by the Provincial Government. As a matter of general interest we are giving a description of tests described by Harold Perrine, head of the Columbia Fire Testing Station, and published in the School of Mines quarterly.

The two main classes into which fire tests are divided are: (1) those conducted upon full-size construction; (2) those upon samples. These are subdivided again as follows:

Full-size tests:
1. Floor construction.
2. Partition construction.

Sample tests:
4. Flooring materials.
5. Moving-picture booth construction.
6. Building materials, used as substitutes for brick, i.e., cast stone, etc.
7. Fireproofed wood.

Full-size tests are, in the main, conducted in structures designed and built for that express purpose. Sample tests, on the other hand, may be conducted in any laboratory equipped with common standard apparatus, gas furnaces, torches, pyrometers, etc.

Tests of Floor Construction

The system to be tested forms the roof of the test house, which structure is essentially a cinder-concrete oven of permanent construction. Properly supported upon piers 2½ feet from the ground is a grate composed of railroad rails and wire mesh, about 250 square feet in area. The vertical distance from the grate to the roof is about 9½ feet. The floor system to be tested is supported by steel I-beams resting on the tops of the walls, spaced at distances suitable to the span or spans under test, and having a clear span themselves of about 14 feet. Ample draft openings and flues are provided to facilitate the control of the fire.

The purpose of the test is to determine the effect of a continuous fire below the floor lasting four hours, at an average temperature of 1,700 deg. Fahr., a temperature generally conceded to be that of a burning building, the floor carrying at the same time a distributed load of 150 pounds per square foot. At the end of the four hours the under side of the floor, while still red hot, is subjected to a 1⅛ inch stream of cold water through a hose at short range, under a 60-pound pressure, for 5 minutes; the upper side of the floor is then flooded with water at low pressure, and afterward the stream is applied at full pressure to the under side for 5 minutes longer. Deflections of beams and floor are measured continuously during the test. On the following day, when the floor is cool, the load is increased to 600 pounds per square foot.

Several cords of dried mixed pine and hardwood, kindled with shavings and kerosene oil, is the fuel used, the frequency of firing depending on the recorded temperatures. Water pressures are controlled by an engine. Temperatures are read from a Siemens-Halske galvanometer, to which are attached three thermo-electric couples at the ends of insulated wire leads. These couples, protected by proper tubing, are inserted through the floor, so that they extend about 6 inches below its lower surface. Deflections are read by Y level, from an elevated position, upon vertical rods placed at various points on the floor. Loading is effected by means of pig iron applied to segregated piles, to insure uniformity, and to eliminate arching.

To pass the above test successfully, no flame must penetrate the floor, no part of the load shall have fallen through, and the beams must have been protected from the effects of fire and water, so as not to have been deflected more than 2½ inches.

Tests of Partition Construction

The structure in which partition walls are tested is 14½ feet long, 9½ feet high. The side walls form the only parts under test, each being 138 square feet in area; the end walls and roof are of permanent cinder-concrete construction. This chamber is supported by foundation walls upon which also rests a grate. Draft openings are [illegible] below the grate at [illegible] suitable chimneys leading from the top of the house.

The partition, or shaft construction, is subjected to a continuous heat from a wood fire for at least one hour. An average temperature of at least 1,700 deg. Fahr. is maintained during the second half-hour. At the end of an hour's fire each wall is subjected to a stream of water on the inside, through a fire hose with a 1⅛-inch nozzle, at 30-pound pressure for a period of 3½ minutes.

The temperature of the oven is observed by a Siemens-Halske galvanometer, to which are attached three couples. One of these is inserted through each partition, projecting about 6 inches into the fire; the third is suspended through the roof. Inward and outward deflections of the walls are measured with reference to a wire stretched horizontally, near and parallel to the middle of their respective faces. Heat conducted through the partition is observed by a thermometer, insulated from radiating heat by a wooden box, its bare mercury bulb being in actual contact with the outside of the partition.

A test of this character is considered successful when neither fire, smoke nor water passes through any part of the wall, nor is it bulged or otherwise deformed to the extent of rendering it unsafe.

Flooring Materials—Sample Test

A composition flooring material to be used in a building of 150 feet in height must be subject to the following test: A sample of the material 12 inches square and of the thickness to be used in service is laid face down upon two cast-iron supports, 1-inch thick, which are lying across the opening of an 8-inch gas and air crucible furnace. Directly beneath the sample, and exposed to the flame from the furnace, is inserted a thermo-couple incased in a quartz or porcelain tube, and connected by leads to a pyrometer. Against the centre of the back of the sample is placed a mercury thermometer in actual contact, but protected by proper means from circulating air currents. The temperature of the furnace is raised gradually from that of the room to 1,700 deg. Fahr. in 20 minutes and then maintained at that point for 10 minutes longer. At the expiration of that time the sample is removed from the furnace and a stream of cold water, at about 60-pound pressure, is directed against its face for one minute.

To pass this test successfully, the flooring should not warp to a great extent, nor should it crack across, burn, or be softened to a depth of more than half its thickness.

Substitutes for Bricks

Material in the form of bricks, artificial stone, etc., before being used within the city limits, is subjected to a series of tests, including transverse and compressive strength, absorption, freezing and fire.

The last test is run upon two samples. These are placed in a cold gas furnace, in the form of an oven, the temperature then being raised to 1,700 deg. Fahr. in one hour. One of the samples is then plunged, red hot, into cold water and results noted. The second sample is allowed to cool slowly in air at room temperature. The material should not disintegrate under this treatment.

Fireproofed Wood

The above term is applied to flooring and interior trim which has been treated by chemical impregnation to render it fire-retardant. It is, in fact, inflammable, if subjected to a hot flame for a sufficient time. But, when properly prepared, it will burn slowly in contact with the fire, but, on removal, will not support combustion, even to the extent of glowing, for more than a few seconds.

Every 2,000 feet of this material is sampled. These specimens are inspected as follows, to prove their fire-resisting qualities. At present, three tests are conducted upon pieces cut from each of the above samples, viz.: (1) Timber test; (2) Crib test; (3) Shavings test.

Timber Test—From each of the submitted samples is cut a piece 12 by 1½ by ¾ inches. This piece is planed to exact size and measured accurately to 0.01 inch. Such samples are then subjected in pairs to a vigorous flame from a gas crucible furnace for 2 minutes, at a temperature of 1,700 deg. Fahr. They are then taken from the fire and the duration of flame and glow noted. The samples are then sawn in two, and the area of the least cross-section measured by planimeter. Specifications for acceptance require a flame and glow of not more than 15 and 20 seconds, respectively, and a percentage unburned area of 45 for softwood and 55 for hardwood.

Crib Test—Cribs are built up in four tiers of sticks ½ by ½ by 4 inches upon a chemists' ring stand, and subjected to an 18-inch flame from a gas torch at an approximate temperature of 1,200 deg. Fahr. Combustion, as evidenced by flaming, must be supported not longer than 20 seconds nor, as evidenced by glowing, for more than 30 seconds.

Shavings Test—Thin shavings, taken from each of the above samples, are placed, in a 2-inch layer, on the wire-mesh bottom of a tin pan 1 foot in diameter. A common bunsen burner, giving a yellow flame, is placed beneath the mesh for 25 seconds. The shavings must not be consumed in less than 5 minutes, nor must the flame reach higher than 6 inches.

Each sample of timber, representing as it does 2,000 feet of lumber, must pass satisfactorily two of the above three tests.

Resume

Reinforced stone concrete floor systems are now accepted, without tests, as are also concrete building blocks, provided, of course, that they meet other requirements as to strength, etc. This marks an advance in our knowledge of the behavior of stone concrete in service, and denotes a feeling of confidence that the floor fire-test as now conducted affords ample protection. In fact, the American Society for Testing Materials has adopted it as a standard.

The same cannot be said of the full-size partition test. It seems to be generally conceded that the duration of the application of fire is about one-half what it should be, to insure the rejection of walls which will afford insufficient protection. The society mentioned above, through its Committee on Fireproofing Materials, recommends a two-hour duration of fire for the completion of this test.

In regard to fireproofed wood, several profitable changes might consistently be made. The timber and crib tests probably should be retained, with slight variation of draft conditions, height of flame, etc., vitally affects the results.

Every advertisement must he honest. Newspaper readers are quick to discover a dishonest advertiser, and discount his statements even more perhaps than the merchandise merits. The public appreciates frankness in regard to merchandise and freedom from exaggeration. The conservative type of advertising is the most certain to build up trade.

Dust Abatement in the United States

The United States Office of Public Roads have issued supplementary reports describing the results of experimental work done from 1907 to 1910 inclusive. These reports include passages which throw some light on the behavior of particular materials or of road crusts made in particular ways, while others illustrate important considerations affecting road design generally.

Oil-cement Concrete.—The trials show the importance of making some change in the manner in which these crusts are put down, since furrows were formed at the joints separating the portions of the crust put down on different days. The principle here involved is, of course, that a road crust needs other than purely lateral support; the sudden change from pyramid support to sheer edge support with lateral resistance results in wear at the joints. It seems that the material has some merits as regards durability, and the wear-resistance of undisturbed parts of the crust was satisfactory.

Tar Crusts and an Oil-asphalt Crust—At one place three experimental sections were put down, one being made with a crust grouted with refined coal tar, another being made with a "refined tar preparation," and the third with oil-asphalt. The two former set hard and smooth, and gave out a ringing sound under horses' hoofs. The oil-asphalt crust was, after more than a year, still soft and malleable when dug out with a knife.

Blast-furnace Slag.—Some of the sections made with blast-furnace slag become loose in the spring thaw, but afterwards pack down to a smooth surface. A crust in which lime was used as a binder withstood the effects of wheels better than those of horses' hoofs, this being a road with defined wheel tracks. With a binder of waste sulphite liquor a slag crust was better binder than in some other sections. A slag crust bound with coke-oven tar was in better condition generally than any of the companion sections.

Sand-clay Crusts.—Several sand-clay crusts are described as giving satisfactory results. A road made in 1908 and inspected in 1911 was found to be "very hard, smooth, free from ruts or dust, and with uniform surface and crown." That such roads allow of continual maintenance is shown by the fact that this section had improved since the previous inspection twelve months before. This was also the case with another road, which gave a ringing sound under horses' hoofs, was in generally good condition, and responded well to proper attention and repair. Another road, recently repaired, was packing well, and a section which had been lately repaired by the addition of new material spread unevenly, was, nevertheless, closely bound and free from ruts.

Some Matters of Principle

Several sections are described as being, at the time of the inspection, free from mud or dust although there had just been heavy falls of rain. One expects to find roads dusty after drought and muddy after drizzle, or free from mud or dust because there has recently been a heavy fall of rain. The observers seem to have been at fault in this matter.

A point which is brought out prominently in some of the passages in the reports is the great importance of avoiding sudden changes in the nature of the crust. This was shown in several cases by the large amount of wear at junctions of road crust with bridges, but the principle extends to corner patching, the vicious practice of patching road crusts
or tougher than the crust itself
quently followed in England.

In several cases damage was done
the trial sections, or the shoulders of t
rutted. In one such case the road was a
not wide enough for the traffic, while in ano
the shoulders were "nothing more than dust
On this road no repairs were done during the
before inspection, and there was no systematic ma
tenance. It is often overlooked that an economica
road may, in some cases, be one with a narrow carriageway proper, the shoulders being systematically maintained in order that they may not be worn below the edges of the crust or be deeply rutted.

A number of the sections required, or seemed to require, no regular attention. Some engineers are definitely aiming at such results, but it is not yet evident whether the constantly maintained crusts or those that hardly need any attention will have the wider range under the traffic conditions of the immediate future. Generally, however, and the point is very important, newly made crusts of certain types laid on good foundations seem, for a few years, to need less attention than is ultimately found necessary. Whether this will lead to a type of crust the whole of which will be renewed every three or four years remains to be seen.

Interesting particulars concerning the constructional development of Vancouver, B.C., are furnished this journal by the City Engineer, Mr. F. L. Fellowes. The 1912 building total was $19,388,322, the classification being as follows: repairs and alterations, $159,313; residences, $3,954,918; hotels, apartment and rooming houses, $6,180,805; factories and warehouses, $1,748,582; offices and stores, $7,344,704. The estimated building expenditure for the present season is $18,000,000. The work of the city engineering department in 1913 involves an estimated outlay of $6,140,502. Among the principal undertakings are the Georgia-Harris viaduct, estimated to cost $524,000; causeway at Stanley Park; Burrard Peninsula joint sewerage scheme, and extensive street paving works.

The many considerations in selecting a property make it necessary for the prospective tenant, in the first instance, to instruct an architect to make a survey of any likely premises and to report upon their stability, their structural condition and cost of conversion to suit the particular trade. If, the property is worth favourable consideration, then the architect should express an opinion as to its value and give an approximate estimate of the sum required to repair the buildings and to make the necessary alterations. Where the freehold of the property cannot be obtained, the lease should be for a sufficient term of years to justify the cost of the alterations and repairs. In either case the price to be paid for a property must be considered in conjunction with the subsequent cost of alterations, repairs, and upkeep of the premises.

The production of steel in France by means of the electric furnace amounted in 1908 to 2289 tons crude and 1235 tons finished. In the three years to 1911 the output rose to 13,850 tons and 8898 tons respectively. As France is the birthplace of the electric furnace this result may be regarded as only natural.

A Practical Method of Testing Reinforced Concrete Constructon

By V. J. Elmont, B.Sc., A.M. Can. Soc. C.E.

A QUESTION which at the present time occupies a number of reinforced concrete engineers and testing institutes the world over, is to find a suitable form of a reinforced concrete testbeam for investigating the strength of material and mixture employed, both before and during the erection of a structure.

The method now in use, for determining the power of resistance of concrete, is to crush small cubes and to consider their ultimate strength as conclusive for a reinforced concrete structure. For columns or other directly compressed members, results derived from these cube experiments will be of use of course, but for the part remaining, which is subject to bending, and this is by far the greater part of the structure, testbeams of reinforced concrete have many advantages. The foremost are:

1. The concrete in a structure is exposed to compression stresses due to bending, this means that the stresses are not uniformly distributed over the section as in cubes.

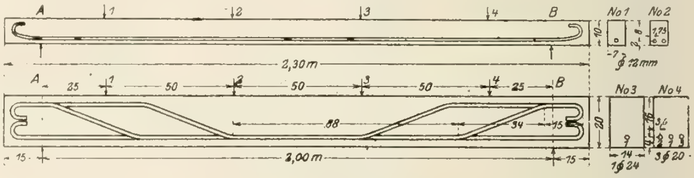
2. To ascertain the strength of a reinforced concrete beam, by testing another of similar composition though not necessarily of the same dimensions, is the best method of procedure, seen from an engineering standpoint. This is due to the fact that the formulae which we are using for figuring a reinforced concrete structure, while approximate only, are near enough for all practical purposes. By applying these same formulae to the test pieces, we place the actual structure on the same basis as the test and from the results obtained, can judge best the strength of the concrete in the structure itself.

3. By means of the testbeams the concrete in a reinforced concrete structure can be tested on the job directly, without any special machinery and by involving only a small expenditure.

4. The educational influence of these tests, made in the presence of the men, should not be underrated. The knowledge derived from observing these tiny beams, which the men see are able to carry a surprisingly large load, and to deflect just as elastically as steel beams, will cause the men to think of what they are doing, a feature which certainly is of the greatest importance in securing good construction.

Loading a test beam.

The purpose of this article is to induce architects, engineers and contractors to investigate this method. It is confidently anticipated that results will be reached in time, which will contribute greatly to safety in reinforced concrete structures. Naturally, for some time to come, the way of proceeding will be to make numerous tests both with cubes and beams at the same time and compare the results. By these we shall obtain a knowledge of the ratio of the strength of concrete in bending compression and direct compression, so that we can determine the strength of the concrete in the columns, from the bending tests with satisfactory exactness. If the Universities and a number of the builders would take this matter up and from time to time publish their results, we should soon have a valuable basis upon which to act.



Test beams.

The question which naturally occurs to architects, engineers and contractors who would go in for these experiments, is, "what dimensions are the most preferable for the testbeams."

To this question it may be answered, that after some experiments made by Prof. Schule, Suenson and others, it seems that the steel percentage ought to be taken not less than four to six per cent. to make sure that the strength of the test-beam depends only on the strength of the concrete. A practical size for the beams is 6 ft. 8 in. long (6 ft. between the supports), 3 in. deep and 4 in. or 5 in. wide. The load is usually applied at the two points 2 ft. from the supports in such a way that the loading is carried over to these points by means of a piece of wood, from a single load at the centre of the beam.

Prof. Shule's experiments developed the interesting and encouraging result, that the size of the testbeams (within the limits he considered) does not exert any significant influence on the crushing strength of the concrete, derived from our reinforced concrete formulae.

The beams, he tested, are shown in the drawing (dimension of bars in millimeters, other dimensions in centimeters). For beams No. 1 and and No. 3, the steel percentage was too small to allow the beam to fail on account of the crushing of the concrete; No. 2 and No. 4 had respectively 3.98 and 3.82 per cent. of steel.

Two kinds of cement were employed (here called A and B). The strength of these cements, tested in the usual way in a mixture of one part cement and three parts normal sand, was found to be:

	Cement A		Cement B	
after	7 days	28 days	7 days	28 days
	lbs./sq. in.		lbs./sq. in.	
Tensile strength......	312	443	289	410
Compression strength	3270	4640	3060	4060

The concrete in the beams and in the cubes made at the same time as the beams, was tested two months after the pouring took place. The average values of the crushing strength of the cube concrete were found to be:

	Cement A	Cement B
Cube with 12 in. side	3770	3000
Cube with 6 in side.	3520	3000
Cube with 5 in. side	3800	....
Prism 5 in., 5 in., 14 in.	3370	2850

The concrete was mixed in the proportion of 485 lbs. cement to one cu. yd. of sand and gravel mixture.

The steel had the following qualities:

	Diam. 12 mm.	Diam. 20 mm.	Diam. 24 mm.
Yielding point	40,500	42,300	36,300
Tensile strength	54,000	56,000	50,600

By using n = 15 (ratio of moduli of elasticity of steel to concrete) and loads of the same intensity at the points 1, 2, 3, 4 (drawing), our formulae gave the following crushing strength of the concrete on the basis of the loads which the beams carried at the breaking point:

	Cement A		Cement B	
Beam	No. 2	No. 4	No. 2	No. 4
Lbs. sq. in.	4320	4550	3920	3870
Ratio of average beam concrete strength to average cube concrete strength	1.19	1.25	1.31	1.29

It is thus unnecessary to use a special size of the cross-section of the testbeams to obtain comparable results.

A convenient load.

The cuts show the method of loading a testbeam (6 cm. × 9 cm.) with one force at the centre of the beam. The loading material here used was water, because of the facility with which it can be applied and removed. At the same time the weight of the load on the beam, corresponding to different deflections, is obtained readily merely by measuring the volume of the water in the bucket.

The business of electrical contractor and consulting engineer carried on by Mr. W. N. Dietrich, Read Building, Montreal, has been incorporated under the name of Dietrich, Limited; the scope of the business is also extended. Mr. Dietrich, the president, was for eight years the electrical engineer of the C. P. R., while Mr. G. E. Templeman, the vice-president, was superintendent of construction in the engineering department of Allis-Chalmers Bullock, Limited. Dietrich, Limited, have in hand various big contracts.

Fastening Machinery to C

THE use of inserts and expansion ly taken the place of the old wo nail, which are daily falling into d course, is due to the progress being ern building construction, where brick, concrete stone are being used extensively, due to fire laws an fact that various kinds of material, interior finish, m ery, etc., have to be fastened to the masonry by some stantial method. Examples of these are machinery of a description, electrical apparatus and iron work to the ceilings, side walls and floors; also railroad appliances, such as signals, etc.

Inserts: The actual field of the insert is limited to construction of new concrete buildings. Its function is to furnish a tapped hole at a certain specific point for fastening any device in final position. Because of this, it is necessary that the contractor, in putting up the forms for the concrete, accurately determine the intended location of the insert and fasten it to the wooden form at exactly the right point, before the concrete is poured. This is true whether the insert is to be placed on the ceiling, floor or wall. If one considers in detail; here, the cost of the labor in marking the location of the insert, and the cost of the insert, and the minimum amount of labor required to fasten it to the wooden forms, there appear three different costs.

To bring out one of the several reasons why the insert will be found to be faulty after the concrete has been poured and the form is knocked away, it is well to call attention to the fact that the lumber used in making the form is seldom, if ever, seasoned, nor can the material be of selected quality, as the first cost would be prohibitive. Good weather may precede the pouring of the concrete, but stormy weather may set in; if the latter, the forms become water-soaked and more or less warping and twisting takes place, which means that the insert which has been fastened upon these forms is thrown out of alignment or square, while in many cases the warping of the timber itself loosens the insert. When the men start to pour concrete, the insert is likely to be thrown out of alignment and the necessary tamping of the mass which follows, further loosens and shifts the insert, so that when the forms are knocked away, it has either shifted its position materially or has been lost entirely, or is so out of square with the surface of the concrete as to make a first-class job impossible. This means material as well as labor loss and the work has to be done all over again in many cases.

Thus we see that the field of the insert is limited, especially in the construction of lofts or buildings in general, for the reason that it is impossible, at the time of designing the building and laying out the concrete forms, to locate exactly the position of the various materials to be supported by the inserts. This is in a measure possible with sprinkler systems, ventilating or heating appliances, but is even difficult with these, and impossible with many other attachments to be hung to concrete walls and ceilings.

Experience shows that in contracting for the installation of material and being compelled to work to the inserts as installed, the cost of labor is usually twice that of the cost of resorting to the use of expansion bolts.

In loft buildings, where tenants are manufacturers in various industries, where machinery and electrical equipment are to be anchored to both floor and ceiling or on the side walls, the insert becomes immediately utterly impracticable.

It is particularly so when a group of bolts are necessary for anchoring some piece of machinery in definite position relative to its neighbors, such as in bolting a motor to the floor or ceiling, where there is an exact relative posi-

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[*] By R. Morley, General Manager [illegible] N.Y.C., in the Concrete Cement Age.

[illegible] between the bolts themselves, and where the location of the complete set is necessarily confined to a definite position where alignment with shafting is necessary. The same annoyance has to be contended with even in drilling for expansion bolts if the drilling is not accurately done.

Now, comparing item for item, as far as labor and material are concerned to show the advantages of a good expansion bolt over those of the insert, we note the following:

For the insert it is necessary to mark on the centering the location of the bolt, with more or less indifferent success as to the result. With expansion bolts it is necessary to locate the position of the drilled holes, but this can be done with a rigid template, and position of the holes definitely located on the concrete wall or floor.

The average cost of the insert, as compared with that of an expansion unit, is somewhat greater, making expansion anchorage the cheaper of the two, as to material.

As against the cost of fastening the insert to the wooden form and indefinite success as to results, we have the cost of electric drilling of the actual holes for the expansion bolt. We accomplish this by an electric hammer system which can be contracted for where quantities are sufficient. The drilling is, we have found, cheaper than fastening inserts on the forms.

A large percentage of inserts are lost when pouring, and those that are not lost or dislodged are thrown out of alignment, necessitating additional cost in bringing them straight. There is no loss on expansion bolts up to this point or afterwards in making the insertion into the drilled hole.

All things considered, when the insert is used as an expansion bolt after the building has been erected, the expense of drilling and inserting and waiting for the concrete to set makes it a very much slower and more expensive operation, whereas the use of expansion bolts is rigid and positive, and furnishes a tapped hole for a machine bolt and not the tapped hole for a lag screw.

Where an insert may be desired on the finished job, as against an expansion bolt, it is necessary to have cement and sand after drilling and installing it, in order that the cement may be made to flow into and about the hole to hold the insert in position. It is then necessary to wait some 12 hours to 24 hours for proper setting before the insert can be used to support its load. An expansion bolt, on the other hand, takes but two or three minutes (according to the size of unit used), after the hole is drilled, when the system can be installed and machinery hung upon the system and removed as frequently as desired.

For example, one minute would be required to drill a hole by an electric hammer drill for a $\frac{5}{8}$-in. expansion bolt, to proper diameter and depth, the hole being $1\frac{1}{8}$-in. in diameter x 2-in. deep. If a greater depth of hole is required, so that the anchorage can be placed back from the face of the wall, we will say it takes two minutes to drill. This class of work is usually done by a man at the rate of $2.50 per day.

Construction of Toronto's Municipal Railways

In addition to the municipal line recently placed in operation on Gerrard street east, by the municipality of the city of Toronto, there is at present under construction two sections of railway which will add about seven miles to their system. On St. Clair avenue the line is practically complete for operation from Yonge street west to the Northern Division of the G. T. R. line, a distance of about 3.2 miles. It is expected that operation of this line will commence inside of two months. On Danforth avenue the work is not so far advanced but it is expected that $3\frac{1}{2}$ miles of line from Broadview to the eastern city limits will be in operation some time this fall.

The work on St. Clair avenue presents a number of interesting features, one of the most important of which was the widening of the street from the original 66 feet to 100 feet. Though this represented a big expense there is little doubt but that the added attractiveness of the avenue with the much greater space allowed for traffic will more than offset the additional capital expenditure.

The St. Clair avenue installation is shown in section in Fig. 1 herewith. It will be noted that the trolleys are suspended from a single pole placed in the centre of the roadway. Each trolley wire hangs 9 feet from the centre line and at a distance 18 feet 6 inches from road level. These poles are set 6 feet in the ground in concrete.

The gauge used on all the municipal lines is 4 ft. $10\frac{7}{8}$ in. to correspond with the Toronto railway system. On the St. Clair line, as seen in Fig. 1, the devil strip is 7 feet wide. No concrete is used under the rails, the filling being gravel to the top of the ties and from there to the top of the rail 2-in. crushed stone. A 4-in. tile drain is placed, as shown, at the centre of the roadway with 3-in. tile at the sides. On each side of the tracks as far out as the inner curb of the roadway, for a distance of 4 ft. 9 in., the space will be sodded.

The roadway on each side of the tracks will be 18 ft. wide with a 4-in. crown. The composition will consist of a 6-in. concrete base, a 1-in. binder and a 2-in. asphalt surface. The concrete walk on either side is 5 ft. 6 in. in width, the sidewalk being placed 2 ft. from the curb and 7 ft. 6 in. from the outer street limits.

At street corners where loading and unloading takes place, the 4 ft. 9 in. grass boulevard will be replaced by cement running back from the corner some 55 or 60 feet.

Lorain section No. 335, 7-in. T-rail, 80 lb. to the yard has been installed on untreated cedar ties. The trolley wire is a No. 2/0 hard drawn round copper. The distributing cable is 500,000 c.m. W.P.T.B. Current will be supplied from the sub-station of the Toronto hydro-electric system on Macpherson avenue, where sufficient converter equipment will be installed to supply the necessary current at 550 volts d.c.

Danforth Avenue

The original 66 ft. road is being widened to 86, and a section of the installation is shown in Fig. 2. The 86 ft. is apportioned as follows: 18 feet for the tracks, 18 feet for each of the side roadways and 16 feet for the sidewalk and corresponding boulevard. The devil strip is 5 ft. 4 in. Lorain section No. 392, 7-in. girder rail is being installed, 90 lbs. to the yard, with tie plates and continuous rail joints. Cedar ties will be used on a concrete bed covered with wood paving. Power will be temporarily supplied from the sub-station of the Toronto hydro-electric system on Gerrard street east.

2/0 round copper trolley wire is used. The trolley wires are suspended from poles placed at the sides of the roadway, wooden poles already installed and belonging to the Toronto hydro-electric system being used on one side and

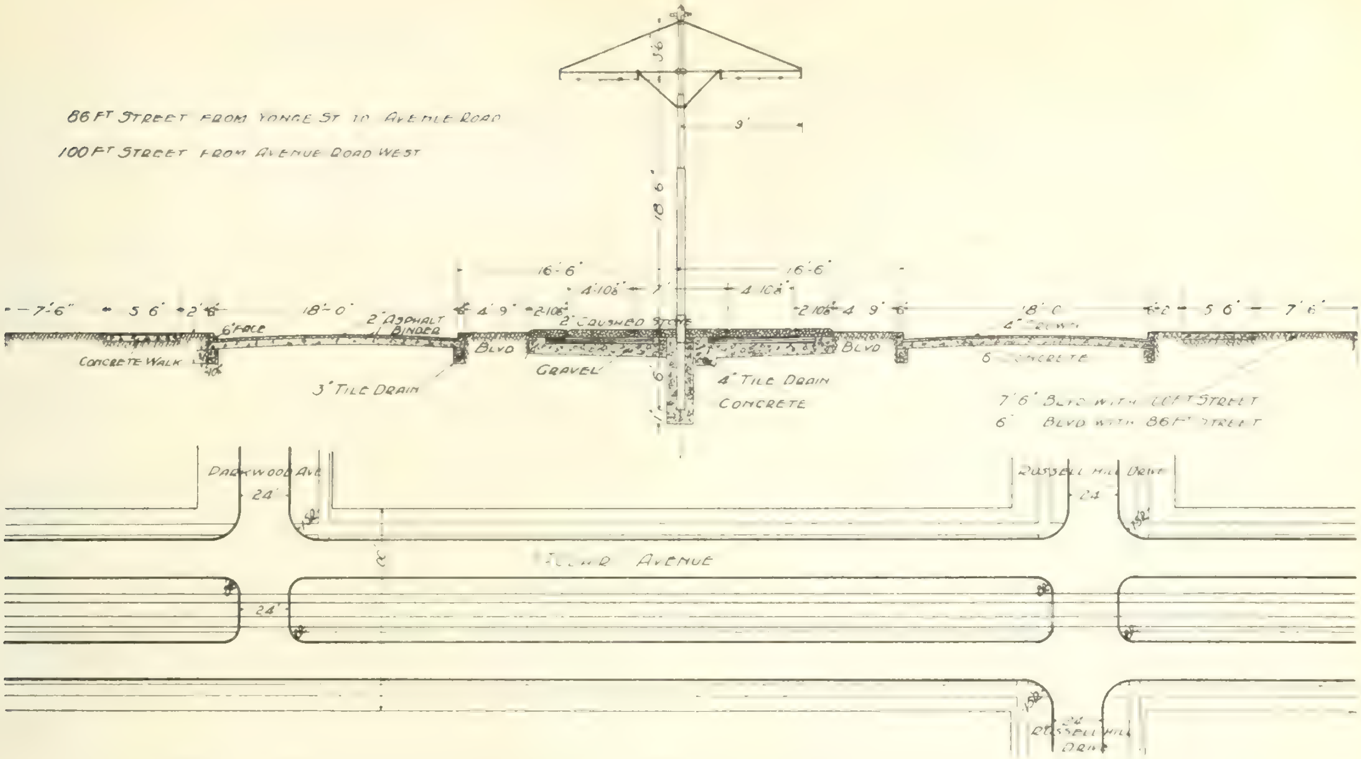


Fig. 1.—City of Toronto municipal street railway lines—Section of St. Clair avenue roadway.

iron poles on the other. These iron poles will carry city lamps for the illumination of the streets. By this reciprocal arrangement the number of poles that must be installed on this street has been reduced by one-half.

Ten cars for each of these lines has been purchased from the Niles Car & Coach Company. The electrical equipment of each consists of four G.E.-80 motors and K-28 controllers with Westinghouse air-brakes, Baldwin trucks and Canada Iron Corporation chilled wheels. Each car is equipped for double end control. The cars will be centre aisle type, p.a.y.e., 44 ft. over buffers, and will be similar to those already in use on the Gerrard street line. When equipped for operation each car will weigh approximately 24½ tons. In all probability the parts will be brought to Toronto and the cars assembled here.

The work of installation of the municipal car system is in charge of the works department under Mr. R. C. Harris, commissioner. More closely connected with the work is Mr. C. W. Power, assistant engineer of railways and bridges. Mr. D. W. Harvey is in immediate charge of the construction work.

Hydro Development on Severn River

The Hydro-electric Power Commission of Ontario have called for tenders for the construction of a concrete dam and a reinforced concrete power-house at Wasdell's Falls on the Severn River. At this point about 1200 h.p. can be developed at peak load and two 600 h.p. generators will be installed. This plant will serve the Cannington, Beaverton, Sunderland district with power and light.

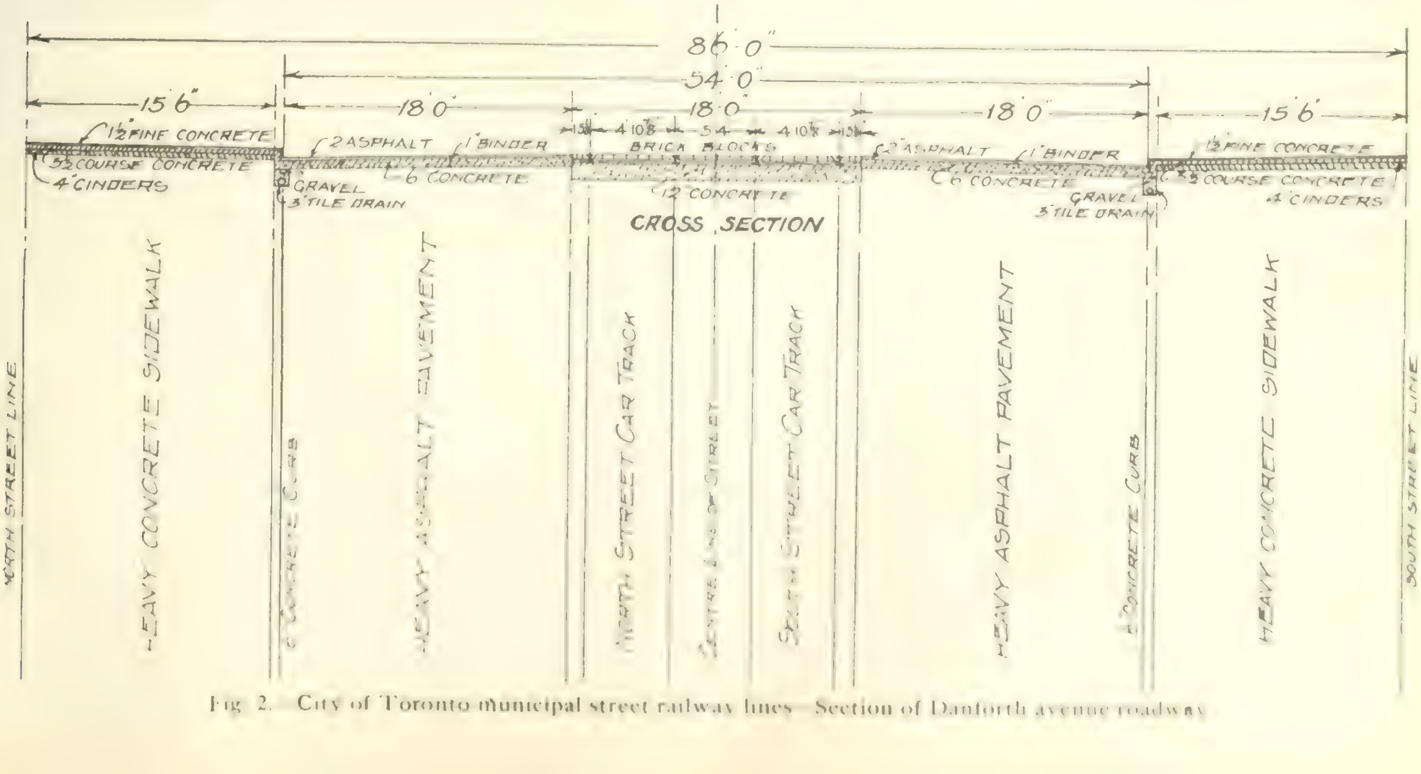


Fig. 2.—City of Toronto municipal street railway lines—Section of Danforth avenue roadway.

Mainly Constructional

The News in Brief—From Coast to Coast

Building permits amounting to over $450,000 were issued at Toronto between June 11 and 16.

The council of the municipality of Esquimalt, B.C., has decided to borrow $400,000 for the construction of a sewerage system.

The two large structural shops of this company are located at Toronto and Bridgeburg, Ont., and have recently increased their capacity.

Dr. Hastings, Medical Health Officer of Toronto, recently stated that between 15,000 and 20,000 houses are needed immediately in that city.

The city of Regina has decided to engage Mr. Thomas H. Mawson, City Planning Expert, to prepare a plan for beautifying that city. Mr. Mawson's fee is to be $8,000.

The Waterworks Committee of the City Council, Ottawa, has accepted, with regret, the resignation of acting Waterworks Engineer Storrie, to take effect on July 1st.

It has been decided to electrify the C. P. R. line between Castlegar and Rossland, B.C. This is a busy branch line of twenty-five miles and takes in the towns of Trail and Smelter.

The Secretary of the Department of Railways and Canals, Ottawa, has called for tenders for the grading of a double track railway from Rockingham to the Halifax Ocean Terminal.

The plans have been completed for the Olympic Building on Smith Street, Winnipeg, and work will be rushed. The building, when completed, will be eight storeys high and will cost $650,000.

The Presbyterians of Regina have sufficient money promised to warrant the erection of the proposed $1,000,000 college and it is expected that in the near future construction will be under way.

It is reported that the charter of the Western Dominion Railway has been sold to the Great Northern Railway. This line is to be constructed through the lands now being prospected for oil southwest of Calgary.

The Canadian Northern is building a branch 160 miles in length called the Canadian Northern Western Railway from the town of Nordegg, Alta. This line is to tap the coal fields in the vicinity of Nordegg.

The street paving program for the year at Edmonton, Alta., is to be reduced to $1,504,000, a figure within $4,000 of the estimate. The work advertised must all be done, but some of it will be held over until next year.

According to the statement of Mr. H. H. Stevens, M.P., of Vancouver, a bill will be brought down at the next session of the Dominion House of Commons, providing for an expenditure of $5,000,000, to be spent in improving Vancouver harbour.

The new quarter million dollar waterworks system for the town of Sarnia was commenced on the 17th. The water will be taken in through the sand to an infiltration basin, from which it will be pumped to the mains by large steam turbine pumps.

A comparison of the figures for building permits for the first five months of 1912 and 1913 between 23 eastern and 26 western cities shows that while the former have an increase of $4,850,000 over 1912, the latter have gone back $5,700,000. Toronto and Montreal lead the east, with increases of $1,800,000 and $1,320,000 respectively, while the twin cities of Fort William and Port Arthur make the best showing for the west with increases of $700,000 and $436,000.

On June 18 Sir John Gibson, Lieutenant-Governor of Ontario, formally opened Toronto's new General Hospital. This institution, which has cost $3,500,000, and is the most up-to-date hospital on the American Continent, was later thrown open to the inspection of the public.

The 45th annual convention of the American Association of Civil Engineers was held at the Chateau Laurier, Ottawa, on June 18. Professor George F. Swain, president of the Association, presented a paper on "Some Tendencies and Problems of the Present Day and the Relations of the Engineers Thereto."

The contract for the new Normal School to be erected in the city of Victoria was let recently by the Provincial Government to Messrs. Luney Brothers, of that city. The contract calls for the completion of the work within the next eighteen months and operations will be started immediately. The total cost will exceed $300,000.

The agreement entered into with the city of Quebec by the Government in regard to the location of the G. T. P. railway workshops at St. Malo, and the Union passenger station at the Palais, has been ratified. The estimated cost of the workshops is $1,500,000, and the Union passenger station with yards, etc., $1,750,000, a total of $3,250;000.

The Canadian Northern Railway is reported to have negotiations under way for acquiring the franchise of the Alberta & Great Waterways Railway. The sale would have the effect of releasing the $6,000,000 deposit of proceeds from the bond sale now being held by the Royal Bank, and $1,000,000 held by the Union and Dominion Banks, while the appeal has been before the privy council.

One hundred thousand dollars of British capital has been interested in the development of the claims of the Nakamun Asphalt and Oil Company at Nakamun and Whitecourt, northwest of Edmonton, which means that the company is now in the position where development work on its asphalt, oil and coal claims will suffer no further delay owing to lack of working capital.

It is reported that the Halifax Dredging Company, which was the successful tenderer for the works at Carleton Point, P.E.I., in connection with the car ferry from New Brunswick to Prince Edward Island at a cost of $700,000, has withdrawn from the contract. The tender was based on the using of Prince Edward Island sandstone, which the department refuses to accept as unfit for the work. Its durability is questioned.

Two miles of new water mains and about the same length of sewers will be constructed in the city of St. John, N.B., within the next two months, if the plans of the commissioner of water and sewerage are carried to completion. Already tenders have been called for the digging of the trenches and the backfill, and it is expected to have the work under way in many of the streets inside of two weeks. The pipe for the water mains has already been shipped from England.

The Samuel C. Cabot Company, Inc., well-known manufacturers of creosote shingle stains, has issued a rather unique booklet illustrating the color effects obtained by the use of their stains. In addition to showing tone results produced, the booklet notes the gradual perfecting of their product and points out their preservative value and the economy involved in their use. The booklet should prove of interest to all requiring stain effects and preservative coloring.

The Vancouver branch of the Canadian Society of Civil Engineers recently paid a visit of inspection to the new cement plant at Bamberton, Saanich Inlet. The plant is not yet in full operation, but the machinery is being tested out, with a view to commencing operations immediately. The capacity of the plant is 2,000 barrels per working day. Wharfage accommodation has been provided, both for shipping of the product and the berthing of the oil steamers. The depth of water at the wharves is adequate for the deepest draft vessels to lie alongside at low tide.

The reorganization of the entire good roads system of old Ontario in a scheme involving an expenditure of at least five million dollars is assuming definite proportions before the Ontario government. Since the adjournment of the session the cabinet has directed constant attention to the framing of a policy, the outline of which is understood to be greater than any yet instituted in the Dominion. The direct purpose is to bind the eastern and western parts of the province together by a series of direct and tributary highways of an unusually excellent order of workmanship and efficiency.

The last of the old C. P. R. bridge over the St. Lawrence between Higlands station and Adirondack is gone. The work of strengthening the foundation of the new spans is almost complete, while at the Dominion Bridge Company the preparation and assembling of the new portions for the two 408-feet spans is being pushed forward as rapidly as possible, so that when all is ready there will be no time lost in floating them into place. This work is scheduled to be finally completed for this fall, and by that time will have occupied about three years to build, and will have cost in the neighborhood of $3,000,000.

Unless financial conditions improve considerably, it is feared that no new paving or sewer construction work will be done by Vancouver this year. Tenders from numerous firms on more than a million dollars' worth of asphalt mixture, wood block and vitrified brick paving, which passed the court of revision on May 26, were opened, but the representatives of the tendering firms were informed that there would be no chance of letting the tenders for the work this year unless the present situation changed. It was arranged that the lowest tenderer should give a guarantee that he would go on with the work when the city was ready.

An honorary commission of six is to be appointed, of which the two mayors are to be members and the others city-planners of recognized standing, to work out a scheme for the artistic development of the cities of Ottawa and Hull. They are to have plans prepared along most modern lines as regards parks, boulevards, location and design of public buildings and facilities for traffic and transportation. To this end, not only the two cities but the government commission and the transportation companies are expected to co-operate. Half the cost of preparing the plans is to be borne by the two cities and the other half by the government.

The city council of Calgary, recently passed an industrial building by-law appropriating $250,000 to construct a building to house small industries. The by-law will now be advertised for the legal period and again submitted to a vote of the ratepayers. The building is to be erected on the most up-to-date lines to provide power, heat, light and manufacturing space, at practically cost, to small manufacturers desiring to get a start. The rentals charged will pay for the maintenance of the building and provide a sinking fund to retire the bonds issued to build it. The industrial bureau already has sufficient applications on hand to fill the building.

The immense steel plant which is to be constructed at Longueuil, P.Q., opposite Montreal, will be for the famous English firm Armstrong, Whitworth & Company, Limited. The town has given the company exemptions from taxes for 20 years. The first building, to be running by May next year, will be five hundred feet in length, of concrete and steel, together with a number of other edifices, housing, twist drill department, tool steel, hammer department, rolling mills, steel foundry, crucible castings, steel forging, and other departments for the manufacture of steel. Units are to be added as the business increases, and it is hoped eventually to employ 5,000 men.

Clayworkers and owners of clay fields in Canada will be pleased to learn that Professor Eugene Haanel, Ph.D., Director of the Mines Branch of the Department of Mines at Ottawa, has announced the intention of the government to build and equip an official laboratory. The purpose of the laboratory is to make experimental concentration and metallurgical tests. The institution is to be fitted with full scale and laboratory size apparatus of the latest design known in science. It is expected that the first week of July of the present year will find the plant ready for operation. The installation of an experimental roasting and sintering plant will be undertaken later in the year.

Since a definite agreement has now been arrived at between the city of Winnipeg and the C. P. R., a start will be made immediately upon the railway's new local terminal facilities. The Westinghouse Church Kerr Company, which has obtained the contract for this work, is now busily putting up temporary quarters for its men, and a commencement is being made upon the excavation work for the hotel extension. Mr. E. J. Brinkerhoff, the engineer in charge for the contractors, states that the company will shortly have about 300 men employed on the work and the whole enterprise will be rushed ahead at the same time. Every effort will be made to have all the improvements finished within two years, and will cost approximately $1,500,000.

Members of the Canadian Society of Domestic, Sanitary and Heating Engineers held their 18th annual convention at Montreal, in the Technical School, placed at their disposal by the Provincial Government. Reports from the various provincial branches were read, and a long discussion took place as to means to be taken to put the organization on a stronger footing. Many suggestions to this end were made, it being pointed out that there was urgent need of co-operation in order to secure trade rights. The question of protection by jobbing houses against small and irresponsible firms was also discussed and protests were made against certain practices by what were termed "curbstone" plumbers. During the convention a conference took place between the engineers and supply houses. Included in the programme was an inspection of the harbor in one of the harbor commissioners' tugs and a visit to the Maisonneuve dry dock.

The following officers were elected: President, Mr. John McKinley, Ottawa; vice-president, Mr. John Watson, Montreal; secretary-treasurer, Mr. E. C. P. Holloway, Ottawa; chairmen of committees: Mr. J. Marr, sanitary; Mr. R. J. McCauley, heating; Mr. J. T. Blythe, legislative; Mr. W. J. Crawford, apprenticeship; Mr. J. E. Walsh, essays.

The next convention will be held in Ottawa.

It has been decided by the Canadian General Electric Company, who control the Canada Foundry Company, Ltd., and the Canadian Allis-Chalmers, Limited, to consolidate the selling organizations of the two latter companies. The name of the Canada Foundry Company, Limited, will be dropped and the two companies conducted under the name of the Canadian Allis-Chalmers, Limited. In future all sales of electrical apparatus and supplies will be in the name of the Canadian General Electric Company, Limited, and all general engineering contracts and sales for mechanical appliances in the name of the Canadian Allis-Chalmers, Limited.

Personal Mention

Mr. Gordon Phillips, Assistant Industrial Commissioner at Winnipeg, received the appointment to the position of Industrial Commissioner of London, the City Council engaging him at a salary of $3,000.

Prof. V. I. Smart, of the department of railway engineering, McGill University, Montreal, Que., has resigned to accept the position of General Manager of the General Railway Signal Company of Canada.

The Railway Belt Hydrographic Survey of the water power branch of the Department of the Interior will have as its assistant chief engineer R. G. Swan, B.A.Sc., of Vancouver, B.C. Kamloops, B.C., will be Mr. Swan's headquarters.

The Gazette announces the appointment of J. T. Johnston, B.A.Sc., as hydraulic engineer of the water power branch of the Department of the Interior. Mr. Johnston will have charge of water power surveys and investigations and inspection work in Manitoba, Saskatchewan and Alberta.

Mr. J. G. Seyfried, Structural Engineer, Grand Trunk Railway, Montreal, has been appointed Engineer, Bridge Department, Canada Foundry Company, Limited. Mr. Seyfried will have his headquarters at the Toronto plant, and also become assistant to the Manager of the Bridge Works, Mr. J. L. Brower.

Mr. Jas. C. Harding, who for the past two years has been a member of the firm of Geo. W. Fuller, has opened an office at 170 Broadway, New York City. Mr. Harding has been engaged in the practice of hydraulic and sanitary engineering for 21 years, which should eminently fit him for the work of consulting engineer, for which purpose this office is being opened.

Mr. E. T. Corkill, Chief Inspector of Mines for Ontario, has been offered, and has accepted, the post of Safety Engineer with the Canadian Copper Company at Copper Cliff. This office is the first of its kind at any mine in Ontario, but the greatly extended operations at Sudbury necessitated it. Mr. T. F. Sutherland, Assistant Inspector of Mines, now resident at Cobalt, will proceed to Toronto on the first of next month to occupy the office vacated by Mr. Corkill. The position at Cobalt for northern Ontario has not yet been filled.

Publications Received

"Solution of Railroad Problems by the Slide Rule," prepared by E. R. Cary, C.E., Professor of Railroad Engineering and Geology, Renselaer Polytechnic Institute, Troy, N.Y., has come to hand. The book is intended to supplement a previous volume dealing with the solution of railroad curves. The work is admirably adapted to its purpose and gives an explanation of the slide rule and then discusses simple, compound, and vertical curves and the application of the slide rule to their solution. The author further shows how the rule may be used to solve problems arising from turnouts, easement curve and earthwork. A series of practical problems and formulae complete this handy volume. The book, which is published by the D. Van Nostrand Company, 25 Park Place, New York, ($1,00 net), is an excellent production from the printer's standpoint in the matter of its clear type and excellent illustrations.

The Civil Engineers' Pocket Book, by Albert I. Frye, S.B., M. Am.Soc.C.E., published by the D. Van Nostrand Company, 25 Park Place, New York, price $5.00, is all that the title indicates. The volume is prepared from a series of notes taken during a period extending over several years. The information obtained has come largely from practical experience and deals with the difficulties which an engineer is likely to encounter. In its encyclopedic qualities, dealing as it does with the mathematics and materials of engineering and the application of these to constructional work, railroad building, bridge building, concrete work, and electric power and lighting, hydraulics, etc., the volume should prove an indispensable pocket book of reference for engineers.

Tacoma, Wash., is operating a new style car. The step is several inches lower than that on the cars now in service, and it will be found that the new cars will be more convenient to enter and leave than the ones now in use. The cars are of the "pay-as-you-enter" type, but "double-ended," which means that they can be driven in either direction. Large vestibules are provided, in one corner of which is the place for the motorman. Doors with glass panes in them block the entrance to the step while the cars are in motion. They have rubber "fenders" on the edges where they meet to prevent a careless passenger from having a finger pinched. Small levers at the conductor's left hand operate the doors. The door on the right-hand side in the front end of the car will be used for alighting only. The motorman will open and close this door, which lowers the step as it is swung back. As it is closed the step is raised up flat against the car. Patent ventilators in both ends provide fresh air all the time, as the air rushes through when the car is in motion. Small dish-like ventilators are in the roof for additional ventilation. One of the features that will attract attention at once as the cars move about the streets is the absence of the row of glass ventilators found on the top of nearly every other car in the city.

The Panama Canal is nearing completion. Although the operations extend over a period of nine years, during the first three years very little was accomplished. At present ninety-nine per cent. of the concrete work has been completed, and there are only 20,000,000 cubic yards of dirt to be excavated. The total expenditure up to date is $290,110,000. Excavation is proceeding at the rate of 2,500,000 cubic yards a month. The waters of the Pacific have been admitted by blowing up the dike south of the Miraflores lock. This dike was destroyed late in May by a blast of 32,750,000 pounds of dynamite in order to allow the dredges working on that section, to pass in and assist on the part not yet completed. The canal will be opened officially in January, 1915. It is quite probable, however, that ships will be able to pass through early this fall. The slides at Culebra are causing some anxiety and have very materially increased the quantity of earth to be removed. The two steam shovels working from opposite ends of the cut met on the afternoon of May 24th. This means that the excavation has been carried down to grade but considerable work must still be done to extend the canal to the required width.

The firm of M. Beatty & Sons, Limited, Welland, Ont., is opening a department in Toronto. H. W. Petrie, Limited, Front street, will represent the firm in Toronto, Hamilton and the adjacent territory. At the H. W. Petrie warehouse will be carried a complete stock of standard size hoisting engines, clamshell buckets, centrifugal pumps, etc. This will doubtless prove of great convenience to intending purchasers of the Beatty products.

Owing to the recent floods the sewers of Hamilton, Ohio, became almost unusable through being blocked. Some, in fact, were completely blocked. A turbine cleaner was sent there for purposes of demonstration. The use of the cleaner resulted in the sewers being completely cleared and made as serviceable as new, at the almost incredible price of 2½ cents per lineal foot. The demonstration was observed by the city council and a number of citizens and as a result the cleaner has been purchased.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Fort Qu'Appelle, Sask.
Waterworks for The Saskatchewan Anti-Tuberculosis League. Engineer, R. H. Murray, Bureau of Public Health, Regina. Tenders received till June 30, 1913, for construction of concrete reservoir and water mains. Plans, specifications, etc., at office of Engineer.

Goderich, Ont.
Town Council have authorized construction of an 8 in. tile sewer on Elgin Ave. Clerk, L. L. Knox.

Ingersoll, Ont.
Sewage system contemplated by the town council. Clerk, W. R. Smith. Plans will be prepared.

Hespeler, Ont.
Waterworks contemplated by the village council. Town engineer, Mr. Bowman. Clerk, Winfield Brewster. Three miles of water mains. By-law will be submitted to ratepayers.

Montreal, Que.
Streets in Lachine as far as 18th ave. and possibly St. Joseph street, will be paved this summer. City Clerk, H. Charette.

Red Deer, Alta.
By-law passed to raise $8,000 for street grading. Sec.-treas., A. T. Stephenson.

Regina, Sask.
Tenders received by City Commissioners up to noon July 12th, for 2 vertical shaft, motor driven centrifugal pumps to operate against 22 ft. head capacity 12,500 gals. per minute each. Further particulars from Architect.

St. Rose, Que.
Water tank. Tenders received by Sec.-Treas. J. A. Joly, until July 7. Plans and specifications at his office and engineers, Ouimet & Lesage, 76 St. Gabriel street, Montreal.

Stratford, Ont.
Addition to waterworks, cost $3,000, planned. Chairman, C. E. McIlhargey. Architect, Thos. Hepburn, Downie St. White brick construction, slate roofing. Walls of main building to be raised and new slate roofing to be put on all buildings.

Strathroy, Ont.
Council will shortly call for tenders for laying new granolithic walks on Scott and Victoria streets. Address, Mayor Owens.

Sudbury, Ont.
Tarvia pavements ,Elm St., planned by town council. Clerk, George Elliott.

Storm sewers on Monck, Elm, Beech, Elgin and Durham streets, planned by town council. Clerk, George Elliott.

Thorold, Ont.
Tenders received by Clerk, D. J. C. Munro, until July 4th, for pavements on Regent, Front, Pine, Vine, Clairmont and Portland streets. Material, brick, bitulithic or other pavement, with concrete curb and gutter. Plans, specifications, etc., at Town Tall, Thorold. Engineers, Chipman & Power, Mail Bldg., Toronto.

Thorold, Ont.
Pavements contemplated by the town council. Clerk, D. J. C. Munro. Plans in progress.

Trenton, Ont.
By-law passed granting $75,000 for extension of sewerage system and paving Front and Dundas streets. Clerk, G. W. Ostrom.

Waterloo, Ont.
Cement walks on Erb, King, Short and Willow streets, planned by town council. Mayor, J. H. Fisher. Engineer-in-charge, Engineer Moogk, Waterloo.

Winnipeg, Man.
Two turbine pumps, cost $10,500. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave. Tenders received by Board of Control until July 2, 1913, for 2 horizontal, 2 stage, turbine pumps, direct coupled to slow constant speed induction motor, switch gear and starter panel. For separating high pressure plant. Specifications, etc., at office of Engineer.

CONTRACTS AWARDED

Kentville, N.S.
Heaps and Partners (Canada), Ltd., 114-115 Dominion Express Bldg., Montreal, Que., have been awarded contract for the supply of over 2½ miles of steel pipe for the extension of their waterworks system.

Listowel, Ont.
Pavements, Victoria Ave. and Penelope St., planned by the town council. Mayor, Wm. Climie. Work will be done by day labor.

Princeton, B.C.
Roadway, cost $12,000, between Tulameen and Hedley, planned by Prov. Govt. Dept. of Public Works. Minister, Hon. Thos. Taylor. General contractor, W. McLean.

St. Thomas, Ont.
Pavements. Contract for 1,150 square yds. pavement on Southwick street, centre to Gladstone, awarded to J. J. Harper, at $1.25 per sq. yd., 8,740 ft. curb and 10,000 sq. yds. pavement on Wilson ave. at 39c per ft. for curb and $8,480 for whole of pavement, and 860 ft. curb and 1,150 sq. yds. pavement on Amelia St. at [illegible] and [illegible] awarded to Crowley & McDonald, Stratford. 3,280 ft. curb and gutter, 3,300 sq. yds. pavement at 55c and $1.20, awarded to Wm. Irwin, 59 Curtis street. Contract for resurfacing [illegible] awarded [illegible]

City at 65c. City Engineer, M. Ferguson.

Welland, Ont.
Pavements and curbs, cost $14,822.64, on several streets, planned by the town council. Clerk, George R. Boyd. General contractor, L. Sacco, Niagara Falls.

Railroads, Bridges and Wharves

Carleton Point, P. E. I.
Car ferry terminal. Tenders received by Sec., L. K. Jones, Ottawa, Dom. Govt. Dept. of Railways and Canals, until July 2nd. Plans at office of Dept. Chief engineer, I. C. R., Moncton, N.B., Horace McEwen, Supt. of P. E. I. Railway, Charlottetown, and office of I. C. R. Ticket Agent, Halifax, N.B.

Collingwood, Ont.
Bridge, over Silver Creek, planned by Nottawasaga and Collingwood Twps. Tenders received by Architect, Jno. Wilson, up to June 30th. Reinforced concrete bridge on town line between above townships.

Gravenhurst, Ont.
Concrete dam planned by Elec. Light & Water Commission. Chairman, W. J. Stubbs. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Tenders received by Chairman until June 28th, for concrete dam at South Falls, Muskoka River. Plans, specifications, etc., at office of Engineers, Toronto.

Greensville, Ont.
Concrete dam, cost $5,000, Dundas Creek, planned by Dundas Water Commission, Dundas. Architects, McPhie, Kelly & Darling, Bank of Hamilton Bdg., Hamilton. 10 x 100, reinforced concrete piles.

Kingston, Ont.
Conduits, cost $34,000, planned by city council. Mayor, T. J. Rigney. Engineer, R. J. McClelland. By-law passed by ratepayers granting above amount for conduit system on downtown streets.

Twps. of Markham & Whitchurch, Ont. (Co. York)
Tenders received by Consulting Engineer, Frank Barber, 57 Adelaide E., Toronto, up to noon June 27th for bridges B 13, B 15, B 16 and B 17.

Ste. Martine, Que.
Bridge, cost $3,450, over Esturgeon River. Sec.-Treas., Nap Mallette. Engineer, L. A. Vallee, Que. One span, 40 x 17, concrete, steel and 4 in. red pine. Tenders called.

Steveston, B.C.
Jetty. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept of Public Works, for camplete jetty at mouth of Fraser River. Plans, specifications, etc., at [illegible]

Postmaster at [illegible]. Time extended to July 2nd.

Sea Gull, Ont.

Extension to wharf. Tenders received by Sec. R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until July 5th. Plans at office of Post Master, Sault Ste. Marie, and J. G. Sing, Confed. Life Bldg., Toronto.

Stratford, Ont.

Culverts and other concrete work at County House of Refuge under contemplation. Clerk, Wm. Davidson. Plans and specifications at County Buildings, Stratford.

Turnbury Twp., Ont.

Two bridges, cost $12,000, planned by Twp. Council. Clerk, John Burgess, Bluevale, Ont. By-law carried.

Thetford Mines, Que.

Bridge, cost $5,900, over Thetford River, planned by Township of Thetford. Sec.-Treas., V. Monissèt, Thetford Mines. Engineer, L. A. Vallee, Que. One span, 50 x 16, concrete and steel, 4 in. red pine. Tenders called.

Woodstock, Ont.

Tenders received by F. J. Ure, engineer County of Oxford, until June 28th, for steel bridge, 75 ft. centre to centre, 4 ft. roadway in Ontario Govt. Specs. Class "A," 1911. Concrete abutments and floor to be included in tender. Further information from Co. Engineer.

CONTRACTS AWARDED

Edmonton, Alta.

Two bridges, $27,194. Mayor, Mr. Short. General contractors, Smith & Keith, 128 Jasper Ave. Each bridge 250 ft. x 55 ft., wood superstructure, trestle work.

Prov. of Quebec

Bridge, cost $4,400, over St. Jean River, planned by the Council of Lavaltrie. Secretary-treasurer, S. Martineau. General contractor, Osias Riel. Steel, Phoenix Bridge & Iron Works, Montreal. One span 20 x 26, concrete and steel.

Bridge, cost $7,000, over Villemaire Brooke, for Council of Mont Laurier. One span, 20 x 26, concrete, steel and red pine.

Bridge, cost $2,800, over Alder Brook, for Township East Farnham. Sec.-treas. Frank Hulburd, Cowansville. General contractor, Isaie Robert, Brigham, Que. One span, 30 x 17, concrete and steel.

Bridge, cost $4,700, over Bedford River, planned by Council of Hebertville. Sec.-treas., J. M. Hudon. General contractor, Jno. Girard Chicoutimi. 1 span, 30 x 17, concrete, steel and 4-inch red pine.

Bridge, cost $8,820, over Etchemin River, for Municipality of Ste. Anseline. Sec.-Treas., L. V. Bernier. General contractors, Sherbrooke Iron Works Co., Sherbrooke. One span, 225 x 17, concrete, steel and 4 in. red pine.

Bridge, over Perdrix River, for Municipality of St. Anastasie de Nelson. Sec.-Treas., G. E. Ruel. General contractors, Lafluer & Aubin, St. Antoine de Tilly. One span, 30 x 18, concrete, steel and 4 in. red pine.

Bridge, cost $4,000, over St. Mathieu River, for Municipality of St. Fabien. Sec.-Treas., J. A. Berube. General contractors, Fortin Freres & Mercier, St. Henri Village. One span, 30 x 18, concrete, steel and 4 in. red pine.

St. Anne des Plaines, Que.

Bridge, cost $8,400, over LaCorne Creek. Sec.-Treas., D. Gauthier. General contractor, O. Carbonneau, St. Anne des Plaines. One span, 25 ft. long x 30 ft. wide, concrete, steel and 4 in. red pine.

Sutton, Que.

Bridge, cost $5,250, over Missisquoi River. Sec.-Treas., C. N. R. Tartre. General Contractors, Jenckes Machine Co., Sherbrooke. One span, 40 x 18, concrete, steel and 4 in. red pine.

Toronto, Ont.

Messrs. John Hayman & Sons have been awarded the contract for the erection of the C. P. R. Station, Queen and Dufferin streets.

West Shefford, Que.

Bridge, cost $6,500, outlet of Broome Lake. Sec.-Treas., N. O. Rockwell, Waterloo, Que. General contractors, MacKinnon, Holmes & Co., Sherbrooke, Que. One span, 115 x 17, concrete and steel.

Winnipeg, Man.

Addition to station and hotel, planned by C. P. Rly. Architects, Painter & Swales, 253 Granville street, Vancouver, B.C. General contractors, Westinghouse, Church, Kerr Co., 611 Confed. Life Bldg. 12 storeys, wing addition.

Public Buildings, Churches Schools, etc.

Bridgewater, N.S.

School, cost $44,000. Clerk, Jas. Currl. Architect, Andrew R. Cobb, Cragg Bldg., Halifax. General contractor, Ken. Fisher. Wood construction, stone and concrete foundation.

Bayswater, Kings Co., N.B.

Wooden lighthouse tower. Tenders received by A. Johnston, Deputy Minister of Marine & Fisheries, until July 17. Plans, specifications, etc., at this Dept., Ottawa, and Agency of the Dept., St. John, and post offices, Kingston, Rothesay, Bayswater and Fairville.

Beachville, Ont.

School, cost $14,200, for West Oxford Twp. Clerk, Byron G. Jenvey, Ingersoll. Plans in progress.

Calgary, Alta.

Commissioners recommend to the council that a by-law be submitted for the establishing of a milk depot. Clerk, J. M. Millan.

Camrose, Alta.

Addition to hospital, cost $5,000, contemplated by the city council. Acting Mayor, P. Smith. Interested, Dr. Stewart.

Coquitlam, B.C.

British Columbia Golf Club, 543 Hastings West, will erect its building near present premises on Austin road.

Kingston, Ont.

Heating system in city hall, cost $12,000, planned by city council. Mayor, T. J. Rigney. Engineer, R. J. McClelland. By-law carried.

Medicine Hat, Alta.

City Council will erect fire halls at 3rd Ave. and East road allowance, and at Toronto st. and West road allowance. Clerk, H. Baker. Architect, J. W. Daley, Building Inspector.

Montreal, Que.

School, cost $100,000, Charles & Saunders, for R. S. School Commissioners. Architects, Asselin, Brosseau & Perron, Imp. Nickel Chambers. General contractor, Jos. Denis, Belgrave, M.D.G. Heating, ventilating and plumbing, Jos. Laurier, 377 Ontario E. General contractor will call tenders later. Three stys., 180 x 65.

School, cost $80,000, Maisonneuve, planned by R. C. School Commissioners. Architect, C. A. Reeves, 58 St. James, Montreal. General contractor, A. Choquette, 170 Bourbonniere.

Church, Fullum, for Parish of St. Lusebe. Rev. H. J. Robillard, 641 Fullum. Architect, Beaubien Champagne, Ecole Polytechnique, 228 St. Denis, Montreal. Excavation, Victor Lafontaine, 184 Chapleau. Concrete, Jos. Denis, Belgrave, N.D.G. Architect will call tenders for other trades, as work progresses. 70 x 90 x 250, stone, terra cotta, brick and structural steel construction, cement foundation.

Post office fittings, St. Lambert. Dominion Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, will receive tenders until July 2nd. Plans, specifications at office of Mr. A. Venne, architect, 76 St. Gabriel street, Montreal, R. L. Deschamps, Supt. of Bldgs., Montreal and at Dept., Ottawa.

Montreal West, Que.

Fire and police station, cost $17,000. Architects, Peden & McLaren, 20 St. Alexis St. Tenders will be called by Architect about July 1st. Two storeys, 35 x 64, brick, concrete foundation, concrete and hardwood floors, felt and gravel roofing.

Mount Denis, Ont.

School, planned by Public School Board. Sec., J. A. Syme. Architects, Mitchell & White, 55 Isabelle St., Toronto. Tenders received by Secretary, until July 5th. Plans, etc., at office of Architect.

North Walsingham Twp., Ont.

School contemplated for School Sec. No. 14. Twp. Clerk., E. J. Hodson, Langton, Ont.

Ottawa, Ont.

Tenders received by A. Johnston, Deputy Minister of Marine & Fisheries, until July 17, for the construction of a wooden lighthouse tower at McColgan's Point, Kings Co., N.B. Plans, specifications, etc., at this Dept., Ottawa, and agency at St. John and post offices, Kingston, Rothesay, Fairville and Bayswater.

Prince Rupert, B.C.

Tenders received by R. C. Desrochers, Secretary, Dept. of Public Works, Ottawa, until July 7, for construction of a doctor's residence, Digby Island, Prince Rupert. Plans, specifications, etc., at office of Wm. Henderson, resident architect, Victoria, B.C., at Public Works, Canada, District Engineer's office, Prince Rupert, and at the Dept. Public Works, Ottawa. Cheque for 10 per cent. must accompany each tender.

Peterboro, Ont.

Customs house, cost $65,000, contemplated by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa.

Fire station, cost $10,000, Park St. S., planned by City Council. City Clerk, S. R. Armstrong. Station to be large enough to hold 1 piece of apparatus and accommodate 6 men, horses, etc.

Rodney, Ont.
Fire hall contemplated by the town council. Clerk, John H. Shaw. Plans will be prepared.

Southwold Twp., Ont.
School, cost $6,000, for School Section No. 12. Twp. Clerk, J. C. McLennan, Fingal. Plans in progress.

Tilbury, Ont.
Fire hall contemplated by town council. Clerk, W. A. Hutton. By-law has been passed and plans are in progress.

Toronto, Ont.
Tenders received by Sec., W. C. Wilkinson, Board of Education, until June 27th, for fireproof floors for Balmy Beach and Carlton schools.

Tenders received by W. C. Wilkinson, Secretary Board of Education, until June 27th, for midsummer school repairs.

Addition to schools, Howard, Deer Park and McMurrich, planned by Board of Education. Tenders received by Sec., W. C. Wilkinson, until June 27th. Plans, etc., at office of Supt. of Buildings.

Jas. Thompson, Victoria St., is calling tenders for erection of a moving picture theatre on Gerrard street.

Waterville, Que.
Post office and customs building, cost $10,000, planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa.

Windsor, Ont.
School equipment required. Tenders received by Sec., Alex. Black, Board of Education.

CONTRACTS AWARDED

Edmonton, Alta.
Nurses' home, cost $60,000, 1st St., planned by city council. Architect, Roland W. Lines, Canada Permanent Bldg. General contractor, O. J. Edinger, General Delivery. 3½-storeys, 34 x 66, concrete foundation, brick construction.

Hamilton, Ont.
Theatre, cost $20,000, for E. J. Guest, c/o Empire Theatre, Barton St. E. Architects, Stewart & Witton, H. P. & L. Bldg. General contractor, Richard Tope, Robinson St. Reinforced concrete, steel and brick construction, seating.

School, cost $40,000, Sherman Ave. N., for Separate School Board. Architect, Robt. Clohecy, 226 John St. S. Electric work, Electric Supply Co., 65 James S. Roofing, Thos. Irwin & Son, McNab St. South.

London, Ont.
Addition to school, cost $[illegible], [illegible]ley Ave., planned by Board of Education. Chairman, Jno. M. Gunn. Architect, A. E. Nutter, Dom. Bank Bldg. General contractor, S. Willis, 765 Talbot street.

Montreal, Que.
Meurling refuge, cost $116,000 ,Champ de Mars and St. Louis. Board of Commissioners, c/o L. N. Senecal, secretary. Architect, Eugene Payette, 103 St. Francois Xavier. General contractor, Theo. Lessard, 210 Park Ave. Marble and tile, Lepage Marble Co., 734 St. Lawrence. Carpenter, T. Benard & Son, 1280 Erables. Steel, Dom. Bridge Co., Lachine. Roofing, heating, plumbing and electric., Cadieux & Briard, St. Dominque. Fumigators, Kensington Eng. Works, Philadelphia. Ornamental iron, Jno. Watson, 167 Wellington.

Club, cost $15,000, 32-34 Sherbrooke, for Montreal Reform Club, 334 University St. Architects, Saxe & Archibald, 59 Beaver Hall Hill. Mason, Bonnell Bros., 341 Guy St. Carpenter, Favreau & Corbeau, 12 Erie St. Heating and plumbing, Westmount Plumbing & Heating Co., 4278 St. Catherine. Electric, L. E. Simoneau, 442 Richmond. Plasterer, R. D. Clarke & Son, 26 Lincoln Ave. 50 x 75, stone foundation, brick construction.

Hall, for Salvation Army, 31 University. Builders and architects, Reid, McGregor & Reid, 14 Guy Block. Carpenter, T. S. Hudson & Co., B12 Board of Trade. Three storeys, 30 x 75.

Convent, cost $150,000, for R. C. School Commissioners of Verdun. Sec.-Treas., O. Deguise. Architect, J. E. A. Benoit, 1198 Wellington. General contractor, T. Sauve, 124 Church Ave.

Regina, Sask.
Incinerator building, cost $130,000. Clerk, A. W. Pool, Engineer, J. W. Bertwistle. General contractors, Parsons Construction & Engineering Co., for building, Mickleborough Block, Scarth St. General contractors, Decarie Incinerator Co., 345 McKnight Bldg., Minneapolis, Minn., for incinerator plant.

Winter fair building, cost $120,345, planned by City Commissioners. Clerk, A. W. Pool. Architects, Storey & VanEgmond, Northern Bank Bldg. General contractors, Parsons Construction & Engineering Co., Mickleborough Block, Scarth street, at $102,000. Heating and plumbing, Potts & Smith, Cornwall St., at $18,345.

Toronto, Ont.
Mr. W. A. Langton, 88 King street east, has awarded the masonry contract on St. Mary's Church, on Westmoreland Ave., to Messrs. Bayliss & Son.

Messrs. Sharp & Brown, 18 Wellington East, have awarded the masonry contract for St. Clements Anglican Church on Jones Ave., to Mr. Wm. A. Bulley.

Winnipeg, Man.
Addition to club house, cost $100,000, for Manitoba Club, Broadway and Fort streets. Architect, J. D. Atcheson, Trust & Loan Bldg. General contractors, Grey & Davidson, Portage Ave. and Arlington street. Foundations going in.

Heating and ventilating system, cost $19,577, in Machray School. Architect, J. B. Mitchell, William and Ellen Sts. General contractors, [illegible] & Co., Wall street.

Business Buildings and Industrial Plants

Edmonton, Alta.
Factory and warehouse contemplated for The Staince Co., 656 3rd St. Manager, A. G. Wildren. Four storeys, to manufacture iron beds, springs mattresses, etc.

Pilkington & Sons, St. Helens, Lancashire, England, are contemplating erecting warehouse for glass. W. Norman Pilkington is staying at the King Edward Hotel, Edmonton, at present.

Georgetown, Ont.
Two brick yards contemplated by the Dominion Clay Products Co., 110 Carlton street, Toronto. Plans in progress.

Innisfree, Alta.
Flour mill, cost $18,000, planned for Robert Weder, Port Saskatchewan. Free site granted and mill will be erected shortly.

London, Ont.
Alteration to G. T. R. Ticket Office, Dundas and Richmond. Architects, McBride & Farncomb, Dundas and Richmond. One storey, 16 x 14 ft. 25in., tile floors, store and office fixtures, grill work, etc. Plans drawn.

Montreal, Que.
One store and residence, cost $6,000, Marianne, for Honorius Corbeil, 350 Fabre. Three storeys, 25 x 25, brick construction. Plans drawn.

Store and flats, cost $15,000, Outremont (Durocher and Lajore), for Mr. Lebault, 100 Parck Lafontaine. Builder, A. Frenette, 212 Fabre. Tenders called by builder for carpentry, masonry, roofing, painting, heating, plumbing and electric work. Three storeys, 45 x 82, pressed brick and stone construction, stone foundation.

Peterboro, Ont.
Bank building, George and Charlotte streets, contemplated by the Bank of Montreal, head office Montreal. Plans in progress.

Tilbury, Ont.
Plant contemplated for the Canadian Forging Co. Ratepayers passed by-law granting loan of $10,000 to company.

Toronto, Ont.
Warehouse planned for L. Yolles, 363-5 Queen St. W. Tenders received by owner. Three storeys, brick construction and foundation, concrete.

Three attached stores and residences, cost $10,000, Sackville, for J. Ellenson, 21 McCaul. Architects, Ellis & Connery, 72 Queen St. W. 2½-storeys, 60 x 42, structural steel and brick construction, stone foundation. Plans drawn.

Warehouse, cost $6,500, Bloor St., for F. Greenaway & J. C. Bolton, 1239 Bloor W. Architect, J. Hunt Stanford, Bloor and Ossington. Two storeys, 25 x 85, structural steel and brick construction, stone foundation. Plans drawn.

Garage, cost $30,000, 254 Dupont St., for E. A. Vansickler, 1063 Bathurst. Architects, [illegible] Smith & Sons, [illegible] Yonge St. [illegible]. Plans are drawn but work will not be started until Fall.

Victoria, B.C.
Victoria Phoenix Brewing Co., 1921 Government St. Company will entirely remodel the Commercial Hotel to comply with new liquor regulations.

Winnipeg, Man.
Warehouse, cost $30,000, Winnipeg Ave., for [illegible] Ltd., 797 Notre Dame Ave. Tenders re-

[illegible] Architects, Jordan & Over, 47 Canada Life Bldg. Two storeys and basement [illegible] x [illegible], concrete foundation, mill construction. Plans, specifications,

CONTRACTS AWARDED

Belle Riviere, Que.

Store and apartments, cost $3,000, for Hudson Bay Co. Architect, J. A. P. Bulman, North Bay, Ont. General contractors, Hunt & Van Kassel, Cochrane, Ont.

Brandon, Man.

Warehouse, for Gordon Mackay & Co., Ltd., Bay and Front Sts., Toronto. Architect. Thos. Sinclair. General contractors, Shepley Construction Co., 510 Builders' Exchange Bldg., Winnipeg. Fireproof construction.

Warehouse, cost $137,000, 7th St., for The Brandon Holding Co. Pres., A. E. McKenzie. Engineer, Thos. Sinclair. General contractors, Shepley Construction Co., 510 Builders' Exchange Bldg., Winnipeg. Four storeys, 60 x 120, concrete foundation, brick construction.

Garage, cost $9,000, Princess Ave., for J. P. Kennedy, c/o Rat Portage Lumber Co. Architects, Shillinglaw & Marshall. General contractor, C. W. Hall, 11th and Victoria. Two storeys, brick foundation, pressed brick construction.

Calgary, Alta.

Stores and apartments, cost $10,000, 8th ave. west, for Mr. Hickman, England, c/o architect. Architects, Archer & Robertson, Dom. Bank Bldg. General contractor, G. J. Davis, Travis Block. Two storeys, 50 x 90, cement foundation, structural steel and brick construction. Excavating done.

Edmonton, Alta.

Warehouse, cost $15,000, Bellamy St., for British American Paint Co., Laurel Point, Victoria. General contractor, F. Woodyard, 528 Clara St. Two storeys, 30 x 100, concrete foundation, brick construction, store fronts and fixtures.

Warehouse, cost $110,000 3rd St., for Purcell & Kelly, 4th St. General contractors, Purcell & Foote. Four storeys and basement, 100 x 130, concrete foundation, structural steel and brick construction. Foundations in.

Store and offices, cost $40,000, Jasper Ave., for Wm. Gibson, Gen. Del., Edmonton. Architect, A. W. Cowley, 406 Agency Bldg., Edmonton. General contractor, J. Sheridan, 639 12th Ave. N. Three storeys, 60 x 120, cement foundation, pressed brick front construction. Excavating done.

Hotel, cost $1,500,000, McDougale St., for G. T. P. Rly. Architects, Ross & MacDonald, 1 Belmont St., Montreal. General contractors, Canadian Stewart Co., 901 Eastern Townships, Bank Bldg., Montreal. Steel work up three storeys.

Stores, cost $10,000, Norton. Owner and general contractor, A. Briere, Gen. Del., Edmonton. Architect, E. Phillips, Gen. Del., Edmonton. Two storeys, 90 x 80, cement foundation, frame construction.

Falmouth, N. S.

Apple warehouse, cost $5,000, for Falmouth Fruit Co. Manager, C. W. McLellan. General contractors, J. H. Hicks & Sons, Bridgetown. 120 x 40, wood construction, concrete foundation.

Hamilton, Ont.

Foundry and storage warehouse, Clark St., for Otis-Fenson Elevator Co., Victoria Ave. N. Architects, Stewart & Witton, H. P. & L. Bldg. Mason, W. H. Cooper, 67 York St. Steel work, Hamilton Bridge Works, Barton and Bay Sts. Roofing, Dennis & Jocelyn, Walnut St. N. Two storeys and basement, 200 x 45, 100 x 70.

Hanover, Ont.

Store, cost $7,500, Main. Owner and builder, Dr. W. A. Mearns. Owner does work by day labor. Two storeys, 25 x 50, structural steel and pressed brick construction, cement foundation. Excavating started.

Montreal, Que.

Store and five flats, cost $7,000, Verville, for Mrs. Wm. C. Ball, 3102 Hutchison. Architect, J. Ogilvie Harris, 180 St. James. Work by day labor. Three storeys, 31-6, 65, cement foundation, brick construction, felt and gravel roofing. Excavating started.

Alterations to bank building, cost $4,000, Viauville, for Merchants Bank, 205 St. James street. Architects, Hogle & Davis, 80 St. Francois Xavier. General contractors, T. S. Hudson & Company, B12 Board of Trade.

Warehouse, cost $5,000, 54 Champlain, for Standard Imports Co., 575 St. Paul. Builder, C. J. Brown, 4263 St. Catharine W. One storey, 64 x 20, concrete foundation, mill construction. Builder does all work but roofing, heating, electric wiring, and will receive bids for these trades.

Bank, cost $3,000, Viauville, for Imperial Bank, Imp. Bank Bldg. Builders, T. S. Hudson & Co., B12 Board of Trade Bldg.

Store and 20 flats, cost $12,000, Drolet. Owner and builder, D. Riopel, 330 Drolet. Three storeys, 158 x 42, brick construction. Foundations in.

Store and garage, cost $15,000, St. Catherine St. W., for R. A. Girard, 1253 St. Lawrence Blvd. Architect, Jos. A. Godin, 269 St. Denis. General contractors, Mt. Royal Construction Co., St. Denis street.

Store and residence, cost $6,500, Lachine, Que. (Dufferin). Owner and builder, Jos. Thibert, 95 3rd Ave. Three storeys, 50 x 46, cement foundation, brick construction, felt and gravel roofing.

North Bay, Ont.

Stores and offices, cost $10,000, Main St., for W. J. Deolin. Architect, J. A. P. Bulman. General contractors, O'Neil & Hanson.

Factory, cost $16,000, Boler, for L'Air Liquide Society, 335 Queen. Architects, Chadwick & Beckett, 15 Toronto street. Roofing, A. G. McIntyre, 492 Richmond. Painting, H. W. Johnston, 209 Church. Heating, J. Harrison, 8 St. Marys street. Plumbing, A. W. Lanter, 167 Robert St. Electrical, W. B. Gibson, 80 Beech Ave. Plasterer, Jos. Robertson, 615 Lansdowne Ave.

Store and residence, cost $4,000, Gerrard, for J. T. Brown, 2221 Gerrard St. Architect and builder, W. H. Lee, 112 Hannaford. 2½-storeys, 25 x 54, structural steel and brick construction, cement foundation, store fronts and fixtures.

Warehouse, 1154 Dundas St. Owner and general contractor, C. A. Ward, 300 College St. Architects, Jas. Louden & Hertzberger, 57 Adelaide. Owner will receive tenders for electric wiring at 1154 Dundas street. Foundations in.

Bakery, cost $5,000, 337 Dupont. Owner and builder, E. C. Andrews, 337 Dupont. Two storeys, 22 x 95, structural steel and brick construction, brick foundation.

Mr. F. S. Baker, Traders Bank Bldg., has awarded the contract for the erection of branch bank for the Royal Bank of Canada on Yonge St., to Messrs. Jas. A. Wickett, Limited, 28 Toronto street.

Vancouver, B.C.

Warehouse, cost $50,000, for John Leckie & Co., 220 Cambie street. Architects, Dalton & Eveleigh, Davis Chambers. General contractors, Geo. Snider & Brethour, Dominion Bldg. Seven storeys, mill construction, brick facing.

Winnipeg, Man.

Addition to office, cost $12,000, William and Ellen Sts., for Public School Board. Sec., R. H. Smith. Architect, J. B. Mitchell. General contractors, Worswick Bros., 124 Hart Ave. Heating, Cotter Bros., Fort street, at $4,476.

Sash and door factory, cost $5,000. Architects and general contractors, Nelson & Forster, 1398 Erin street. Permit issued.

Residences

Beauharnois, Que.

Residence, cost $7,000, for Mr. Wilkes, 704 Unity Bldg., Montreal. Architect, H. Shorey, 56 Beaver Hall Hill, Montreal. Two storeys, 25 x 40, stucco and brick construction, concrete foundation. Plans drawn.

Medecine Hat, Alta.

Harrison & Ponton plan to erect 15 residences on Crescent View. 1½-stys., 27 x 32, concrete foundation, frame construction, shingle roofing.

Minnedosa, Man.

Manse, cost $4,000, for Presbyterian Church Congregation. Two storeys, 32 x 30, brick, concrete foundation. Specifications, etc., at office of Architects, Shillinglaw & Marshall, who will receive tenders.

Montreal, Que.

Flats, cost $25,000, St. Laurent. Owner and builder, Gilbert Demers, 1215 St. Denis, will receive tenders for brick work this week.

Flats, cost $6,000, Christophe Colombe, for Noel Dubuc. Builders, mason and carpenter, Richer & Forese, 2607 St. Hubert. General contractor is open to receive tenders for other trades. Three storeys, 25 x 60, brick construction, cement foundation. Excavating started.

Ottawa, Ont.

Residence, cost $4,500, Grosvenor, for T. Bayne, 65 Aylmer Ave. 2½-stys., 26 x 34, brick construction, stone foundation. Plans drawn.

Toronto, Ont.

One detached residence, cost $5,700, for H. C. Tolchard, 76 Sheldrake. Architect, J. M. Jeffrey, 708 C. P. R. Bldg. Two storeys, 24 x 36, brick construction and foundation. Plans drawn.

Victoria, B.C.

Residence, cost $30,000, for W. A. Lewthwaite. Architects, Wilson & Milner, 221 Pemberton Block, Victoria.

Three storeys, rock and stucco construction. Plans in progress.

Apartment, cost $15,000, Menzies and Toronto Sts., for S. & H. Martin, 210 Pemberton Block. Architect, H. T. Whitehead, 13 Green Block. Two stys., frame construction. Plans ready.

Apartment, cost $10,000, Southgate St., planned for Building and Finance, Ltd. Architect, Louis R. Hazeltine, Rm. 3, McGregor Block. Three storeys.

Winnipeg, Ont.

Residence, cost $17,000, Wellington Crescent, for H. A. Mullins, Notre Dame and Princess Sts. Architect, R. G. Hanford, Carlton Bldg. 2¼-storeys, 48 x 48, concrete foundation, brick veneer construction. Plans drawn.

Residence, cost $10,000, Betourney St., for R. R. Dobell, 52 Smith St. Architect, C. W. U. Chivers, 502 Keewaden Bldg. 2½-storeys, stone foundation, brick veneer construction. Plans drawn. Contract will be let shortly.

CONTRACTS AWARDED

Belleville, Ont.

Residence, cost $5,000, Albert. Owner and builder, John Donoghue. One sty., 30 x 35, frame construction, stone foundation. Excavating started.

Edmonton, Alta.

Apartments, cost $8,000, Ottawa St., for A. Lawrence, 558 Fraser Ave., Edmonton. General contractors, Edmonton Construction Co., Ltd., 658 4th St., Edmonton. Two storeys, cement foundation, frame construction. Dimensions, 40 x 41. Excavating started.

Residence, cost $10,000, 15th St., for G. P. Sanderson, 996 25th St., Edmonton. General contractor, F. Craddock, 492 Richard Ave., Edmonton. 2½-storeys, 29 x 42½ ft., brick foundation, frame construction. Excavating started.

Residence, cost $10,000, Jasper E., for W. S. Robertson, 6 Yale Hotel, Edmonton, Alta. Architect, A. M. Calderon, 259 Jasper West. General contractor, W. J. Carter, Credit Foncier Block, Edmonton, Alta. 1½ storeys, 45 x 45, cement foundation, frame and brick construction.

Edmonton South, Alta.

Residence, cost $5,000, 1st Ave. N. G. Springer, 29 College Ave. Edmonton S. General contractor, C. Clausen, 29 College Ave., Edmonton S. Two storeys, 24 x 41, concrete foundation, frame construction. Excavating started.

Residence, cost $5,000, 8th Ave. N. Architect and builder, Wm. Bruce, 629 8th Ave. N.E., South Edmonton. Two storeys, 24 x 36, concrete foundation, brick construction.

Hamilton, Ont.

10 residences, cost $15,000, Barton St. Owner and general contractor, R. B. Ratcliffe, 534 Main St. E. Brick construction, concrete foundation.

London, Ont.

Residence, cost $10,000, for Mr. Boaker, Manager, Dominion Bank. Architects, Watt & Blackwell, Bank of Toronto Bldg. Carpenters, Dodd & Sons, rear 448 King street. Plasterer, W. Copp, 31 Beaconsfield ave. Plumbing, Hunt & Company, 533 Richmond street. Elec. work, Benson Wilcox Electric Co., Dundas street.

Montreal, Que.

15 flats, cost $12,000, Fullum. Owner and builder, Alphonse Larose, 1282 Delorimier. Three storeys, 90 x 42, cement foundation, felt and gravel roofing. Excavating started.

Two residences, cost $16,000, Victoria ave., Westmount. Owner and builder, Anglins Ltd., 65 Victoria street. Brick construction, cement foundation.

Six flats, cost $8,000, Old Orchard. Owner and builder, J. Normandeau, 1679 Notre Dame W. Three storeys, 50 x 40, brick construction, cement foundation.

Four flats, cost $22,500, Old Orchard. Owner and builder, Anglins Ltd., 65 Victoria street. Two storeys, 150 x 98, brick construction, concrete foundation. Excavating started.

Flats, cost $8,000, Berri. Owner and Builder, H. L. Desaulniers, 1077 Sherbrooke E. Three storeys, 35 x 70, cement foundation. Excavating started.

Three flats, cost $7,000, Hutchison. Architect and builder, J. J. Valois, 2478 Hutchison. Three storeys, 25 x 70, brick, cement foundation. Excavating done.

Flats, cost $10,000, Notre Dame de Grace, for Beaupre & Fils, 597 St. Paul. Architects, MacDuff & Lemieux, Merchants Bank, St. Catherine W., Montreal. Excavation and brick, A. Charette, 1121 St. Antoine. Carpenter, painting and glazing, Lefebvre & Provost, 34 College. Roofing, heating, plumbing and electric work, Hickey & Aubut, 93 Dominion. Two storeys and basement, 25 x 66, pressed brick construction, masonry foundation.

Two cottages, cost $25,000, Outremont (Davaar), for A. R. Tourgis, 444 Durocher. General contractor, Art Chausse, c/o Owner. Owner will call private tenders. Two storeys and basement, 25 x 50, cement foundation, stone and pressed brick construction.

Residences, cost $10,000, Outremont (Durocher). Architect and builder, A. Lacasse, 2224 St. Denis St. Three stys., 25 x 74, brick, stone foundation. Excavation started.

Six flats, cost $7,000, Rivard. Architects and builders, Gilletz & Share, 1206 St. Urbain. Three storeys, 40 x 55, brick construction. Foundations in.

12 flats, cost $8,000, Fortune. Architect and builder, I. Valiquette, 256 Church, Verdun. Three storeys, 46 x 37½, brick, cement foundation. Excavating started.

Two flats, cost $8,000, Melrose, for Hooper Mallett, 1063 Mt. Royal Ave. W. Builder, Chas. Fyfe, 137 Park Ave. Heating, plumbing and electric., Staton & Bowell, 2554 Mance. Two storeys, 18 ft. 9 in. x 42, cement foundation, brick construction.

Garage and flat, cost $7,000, Seaforth Ave., for J. N. Greenshields, 9 MacGregor. Architect, K. G. Rea, 54a Beaver Hall Hill. Builder, John Allan, 300 Atwater Ave. Two storeys, 30 x 49, cement foundation, brick construction.

Residence, cost $[illegible],000. Owner and builder, Z. Lamoureux, 2996 St. Laurent. Two storeys, 30 x 82, brick construction. Foundations in.

Two flats, cost $10,000, Wilson. Owner and builder, Jos. Laporte, 217 Oxford. Two storeys, 32 x 28, brick, cement foundation.

Residence, cost $1[illegible],000, for S. B. White, 14 The Waldemar Apts. Architect, K. G. Rae, 54a Beaver Hall Hill. Mason and carpenter, A. K. Hutchison, 4404 St. Catherine. Two storeys and basement, 25 x 60, brick, cement foundation.

Residence, cost $15,000, for A. C. Stead, 575 Lansdowne. Architect, K. G. Rea, 54a Beaver Hall Hill. Mason and carpenter, Reid, McGregor & Reid, 14 Guy Block. Two storeys and basement, 25 x 50, cement foundation, brick construction.

Residence, cost $12,000, for H. G. Budden, 11 Carleton Apts. Architect, K. G. Rea, 54a Beaver Hall Hill. Carpenter and mason, A. K. Hutchison, 4404 St. Catherine. 2½-storeys, 25 x 60, brick, cement foundation, hardwood floors.

Nine flats, cost $6,000. Owner and builder, N. Levesque, 786 Dorion. Three storeys, 30 x 40, brick construction. Foundations in.

Twelve flats, cost $8,000, 8th Ave. Owner and builder, Abraham Loyer, 379 6th Ave., Rosemount. Three storeys, 75 x 40, cement foundation, felt and gravel roofing. Excavating done.

Montreal West, Que.

Residence, cost $7,000, Westminster, for J. H. Eccles, 234 Ballantyne Ave. Builder, general contractor, carpenter, mason, roofing and painting, Owner. Heating and plumbing, Jas. Saunderson, 340 Victoria. Electric, Mr. Clayton, c/o Owner. Plasterer, Mr. Sims, Montreal W. Two storeys, 25 x 45, cement foundation, concrete brick construction. Excavating done.

Residence, cost $12,000, Westmount (Argyle), for H. V. Shaw, c/o Jackson & Savage, 78 St. Peter street. Architects, builders, painting, mason and carpenter, White Construction Co., 215 Coronation Bldg. Roofing, Geo. W. Reed & Co., Ltd., 37 St. Antoine. Heating and plumbing, Rea & Skead, 1074 St. James. Electric, Spencer & Aspinall, 617 New Birks Bldg. Electric fixtures, Robt. Mitchell Co., St. Catherine St. Tile work, part to The Locker Co., 143 Mansfield, part to Robert Mitchell Co., St. Catherine St. Foundations in.

Residence, cost $8,000, Outremont, for A. Leduc, 43 St. Gabriel. Builder, J. Martell, 1220 Messier. 2½-storeys and basement, 32 x 44, cement foundation, pressed brick construction. Excavating started.

Two residences, cost $12,000, Wolseley. Owner and builder, C. S. Jones, Strathearn Ave. Two storeys, 25 x 50, encased brick construction. Foundations in.

Moose Jaw, Sask.

Smith Construction Co., Kennedy Bldg. Winnipeg, will erect ten residences, cost $2,500 each, Connaught street. 2½ stys. and basement, frame construction, hardwood floors, shingle roofing, electric lighting, hot air heating. Excavating on some, foundations in on some.

Ottawa, Ont.

Addition to residence, cost $[illegible], Laurier W., for Miss Clemow, Laurier Ave. W. Architect, W. E. Noffke, Central Chambers. General contractors, Alexander & Campbell, 587 Lisgar. 26 x [illegible], stucco and frame construction, stone foundation.

Alterations and addition to apartments, cost $7,000, for Mrs. H. Lyons, 316 Besserer. Architect, W. E. Noffke, Central

(Continued on page 70)

Tenders and For Sale Department

[illegible] the undersigned, [illegible] Interior Fittings, Post [illegible] will be received until 4 p.m. on **Monday, June 30, 1913**, for the work [illegible]

Tenderers will not be considered unless made upon forms supplied by Department and in accordance with conditions contained therein.

Plans and specification to be seen on application to Mr. D. McKenzie, Caretaker, Port Arthur, Ont.; Mr. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, Ont., and at the Department of Public Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
[illegible] Ottawa, June 12, 1913. 25-26

THE PAS, MANITOBA

Sealed tenders, registered and endorsed on the envelope, Tender for (tender bidding on) and addressed to H. H. Elliott, M.D., Secretary-Treasurer of the Town of The Pas, will be received up to 6 p.m., **July 1st, 1913**, for the supply of the following materials, and the performance of certain works:

Tender A

Supply and delivery of—
3770 ft. of 24-in. Vitrified Sewer Pipe.
5470 ft. of 20-in. Vitrified Sewer Pipe.
2000 ft. of 18-in. Vitrified Sewer Pipe.
600 ft. of 15-in. Vitrified Sewer Pipe.
1200 ft. of 6-in. Vitrified Sewer Pipe.

Excavating and laying and construction of Manholes, Catch Basins, Flush Tanks, etc.

Tender B

Trenching and laying of approximately—
4400 ft. of 12- in. steel pipe.
[illegible] ft. of 10-in. steel pipe.
4400 ft. of 8-in. steel pipe.
2000 ft. of 6-in. steel pipe.

Setting Valves, Hydrants, etc., and back filling.

Tender C

For the erection of Power House.

Tender D

For the erection of Pole Line.

Tender E

For the supply, delivery and erection of Motors, Pumps, Piping, and Air Compressor.

Tender F

For the supply and delivery of Poles, Wires, Line material, etc.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque the tenderer may furnish the bond of an approved surety company. The lowest or any tender not necessarily accepted.

The tender forms must be filled in—copies of which are attached to the specifications, or are obtainable at the office of the Consulting Engineers.

Plans and specifications may be seen at the office of the Consulting Engineers, The Canadian Engineer, 820 Union Bank Bldg., Winnipeg, and at the resident engineer's office, The Pas, Man., or a complete set of plans and specifications for any contract will be given or forwarded on a deposit of Twenty-five ($25) Dollars, and a set covering all contracts on a deposit of One Hundred ($100) Dollars. The deposit cheque will be returned if plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D.,
Secretary-Treasurer,
The Pas, Man.

MURPHY & UNDERWOOD,
Consulting Engineers,
23-26 Ross Block, Saskatoon, Sask.

First class firm required to take Sales Agency for large firm manufacturing all classes glazed and enamelled tiles, hand painted panels, etc. Write W. Godwin & Son, Limited, Withington, Hereford, England. 24-25

Sealed tenders addressed to the undersigned and endorsed "Tender for Supplying Coal for the Dominion Buildings," will be received at this office until 4 p.m., on **Monday, July 14, 1913**, for the supply of coal for the Public Buildings throughout the Dominion.

Combined specification and form of tender can be obtained on application at this office and from the caretakers of the different Dominion Buildings.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the contract. If the tenden be not accepted the cheque will be returned.

By order

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 14, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42889. 26-27

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Elmira,, Ont.," will be received until 4 p.m. on **Wednesday, July 2, 1913**, for the construction of a Public Building at Elmira, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained on application to the Postmaster at Elmira, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering declines to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 9, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—40373. 25-26

TENDERS
FOR
Concrete Conduit

Sealed proposals will be received at the offices of the Water Commissioner, City Hall, until 12 noon, July 15th, 1913, for the fabrication and laying of about 27½ miles of reinforced concrete pipe and appurtenances on the line of the Sooke Water Supply gravity conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer, for such construction, pursuant to the provisions of By-law No. 814, and adopted by the Council.

Plans and specifications can be seen, and forms of tender obtained, at the Sooke Water Supply Office, 1414 Douglas street, Victoria, B.C.

The lowest or any tender not necessarily accepted.

C. H. RUST,
Water Commissioner.

Victoria, B.C., June 14th, 1913. 26-28

Department of Railways and Canals, Canada

Call for New Tenders

Car Ferry Terminal, Carleton Point, Prince Edward Island

Sealed tenders, addressed to the undersigned and marked "Tender for Car Ferry Terminal, Carleton Point," will be received at this office until 16 o'clock on **Wednesday, July 2nd, 1913.**

Plans, specification and form of contract to be entered into can be seen on and after June 14th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B., at the office of Horace McEwen, Superintendent of the Prince Edward Island Railway, Charlottetown, P.E.I., and at the office of the I. C. Ry. Ticket Agent, 107 Hollis St., Halifax.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $50,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.

Department of Railways and Canals,
Ottawa, June 12th, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—43505. 26

Extension of Time

Orillia Water, Light and Power Commission

Water Works Extensions

Tenders will be received by the Chairman of the Commission up to July 10th, 1913, for the following works:—

Contract A.—Pipe laying.
Contract B.—Pump house.
Contract C.—Furnishing cast iron pipe and specials.
Contract D.—Furnishing gate valves and hydrants.
Contract E.—Pumping machinery.
Contract F.—Reinforced concrete receiving basin.
Contract G.—Furnishing 150 h.p. H. R. T. boiler.
Contract H.—Electrical equipment.

Plans and specifications will be on file at the Engineer's office, Orillia, and with the Canadian Engineer, Toronto, on and after June 18th, 1913.

The lowest or any tender not necessarily accepted.

E. LONG, Chairman.
W. K. GREENWOOD, Engineer.

25-27

Department of Railways and Canals, Canada

Welland Ship Canal

Section No. 1

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Section No. 1 Welland Ship Canal," will be received at this office until 16 o'clock on **Thursday, July 17th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after June 4th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in charge, St. Catharines, Ontario.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of fifty dollars. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signatures, the nature of the occupation, and place of residence of each member of the firm.

[illegible] 000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into a contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be [illegible] fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order.

[illegible]
Asst. Deputy Minister and Secretary.

Department of Railways and Canals,
Ottawa, June 2, 1913

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 42903. 25-26

Tenders Wanted

Tenders will be received by the undersigned up to six p.m., **June 21st**, for the building of a brick addition, consisting of four rooms, two halls and stairways to Georgetown Public School.

Lowest or any tender not necessarily accepted.

Plans and specifications may be had by applying to

JNO. A. THOMPSON,
Secretary P. S. Board,
25 Georgetown, Ont.

Province of Manitoba

TENDERS

Sealed tenders, marked "Tenders for New Parliament Buildings," will be received by the undersigned up to noon on **Wednesday, July 2**, for the construction and completion of the new Parliament Buildings, Winnipeg. Buildings to be completed and ready for occupation on or before first day of May, 1917.

Plans and specifications and forms of tender can be obtained on application to the Provincial Architect, 261 Fort street.

Tenders must be accompanied by a marked cheque for five per cent. (5 p.c.) of the amount of tender, which will be forfeited to the Government of Manitoba, in case the successful tenderer refuses or neglects to enter into a written contract, or, having done so, neglects or fails to carry out the provisions thereof.

The lowest or any tender not necessarily accepted.

G. R. COLDWELL,
Acting Minister of Public Works.

[illegible] May 26, 1913 25-26

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Preston, Ont.," will be received at this office until 4 p.m. on **Wednesday, July 2, 1913**, for the work mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto, at the Post Office, Preston, Ont., and this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

[illegible] the order of the Honourable the Minister of [illegible] of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

[illegible] the lowest or any tender.

By order.

R. C. DESROCHERS,
[illegible]

[illegible]

Newspapers will not be paid for this advertise[illegible]

CITY OF REGINA, SASK.

TENDERS

Sealed tenders will be received by the City Commissioners at Regina, Sask., up until noon of **July 12th** for the supply of: Two vertical shaft, motor driven, centrifugal pumps to operate against 22 foot head, capacity 12,500 gallons per minute each.

Tender to be accompanied by a marked cheque for 5 per cent. (five per cent.) of the amount of tender.

Further particulars may be obtained from E. W. Bull, Superintendent of Light & Power Department, Regina, Sask. 25-28

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Extension to Wharf at Sea Gull, Ont.," will be received at this office until 4 p.m. on **Monday, July 14, 1913**, for the construction of an extension to wharf at Sea Gull, on St. Joseph's Island, District of Algoma Ont.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the office of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmasters at Sault Ste. Marie, Ont., and Sea Gull Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned

[illegible]

By order.

[illegible]

[illegible]

ORILLIA

Water Works Extensions

[illegible] extensions has [illegible] the advertisement that [illegible]

A. K. GREENWOOD,
Engineer.

VILLAGE OF MERRITTON

SIDEWALKS

[illegible] "Tender for Sidewalks," [illegible] to R. Clark, Municipal Clerk, Merritton, Ontario, will be received until six o'clock p.m., July 10, 1913, for approximately 150,000 [illegible] Sidewalks.

Plans, specifications, and forms of tender, may be obtained on application to the Municipal Clerk, Merritton, or at the Engineer's office, St. Cath- [illegible]

An accepted bank cheque for the sum of $500, made payable to the Corporation Treasurer, must accompany each tender.

The lowest or any tender not necessarily ac- [illegible]

R. CLARK, Clerk,
Merritton, Ont.
F. N. RUTHERFORD, C. E.,
26-27 24 Queen St., St. Catharines, Ont.

CITY OF REGINA

SIDEWALKS

[illegible] City Commissioners, Regina, will be received up until 12 o'clock noon, July 9th, 1913, for the following [illegible]

Construction of approximately 500,000 sq. ft. of concrete sidewalk.

All information regarding the above may be obtained on application to F. McArthur, City Engineer.

A marked cheque for 5 per cent. of the amount of the bid must accompany each tender.

The city reserves the right to divide the work into two or more contracts, and to reject any or all tenders.

J. MARTIN, Mayor.
L. A. THORNTON,
[illegible], City Commissioners.
26-27

TOWN OF THOROLD

Province of Ontario

PAVEMENTS

Sealed tenders will be received by the Town Clerk until 8 p.m. on **Friday, July 4th, 1913,** for constructing permanent pavements on portions of [illegible]

(a) Regent Street and Front Street, Brick Pavement with Concrete Curb.

(b) Pine Street, Bitulithic or other pavement, with Concrete Curb and Gutter, and brick [illegible]

(c) Vine street, Clairmont street, and Portland street, Bitulithic or other pavement, with Concrete Curb and Gutter.

No tender necessarily accepted.

Plans, specifications, etc., may be seen at the Town Hall, Thorold.

For further information address the Engineers, Mail Building, Toronto.

JOHN BRODERICK, Esq., Mayor.
D. J. C. MUNRO, Esq., Town Clerk.
CHIPMAN & POWER, Engineers.
26-27

Tenders For Bridge

Sealed tenders will be received up to 5 p.m., **July 4th, 1913,** for the erection of a Warren Truss Steel Bridge to be built over the Sauble River between the Townships of Arran and Sullivan, and for concrete abutments for same, and also for steel piling which may be used instead of concrete. Plans and specifications may be seen with James Warren, Engineer, Walkerton, or with the undersigned.

(Signed) S. K. EWART,
Chesley, Ont.
Walkerton, June 13, 1913. 26-27

Tenders for Dredging

Sealed tenders will be received at the Clerk's office, Chatham, Ont. (where plans and specifications can be seen) up to 12 o'clock noon, on **Thursday, July 31st, 1913,** for dredging about 9 miles of drainage work in the Township of Dover, County of Kent. The work to be let subject to the final passing of the By-law.

The lowest or any tender not necessarily accepted. Tenders must be marked "Tenders for Dredging," and each accompanied with a maiked guarantee cheque for $2,000.

Dated, June 17th, 1913.

H. M. BEEHARD, Reeve.
JOHN WELSH, Clerk,
26-30 Chatham P. O.

TENDERS

Concrete Bridge at Saskatoon

Sealed tenders will be received up to 16.30 o'clock on **Tuesday, the 15th day of July, 1913,** for the under-mentioned work:—

Construction of a concrete bridge over the South Saskatchewan River at Saskatoon.

Tenders for this work must be accompanied by accepted cheque on a chartered bank, or other satisfactory deposit for the sum of $15,000. Deposits of unsuccessful tenderers will be returned when contracts are signed.

The right to reject any or all tenders, or to waive any defects or irregularities therein is to be at the discretion of the Chairman of the Highway Commission.

Plans, specifications, forms of tender and all information may be obtained on application to the undersigned.

A deposit of $50 must accompany each request for copy of plans and specifications; this amount will be refunded on the return of the plans.

The unauthorized insertion of this advertisement will not be paid for.

A. J. McPHERSON,
Chairman, Board of Highway Commissioners.
Regina, Saskatchewan.
June 20th, 1913. 26-28

Piles For Sale

A carload of piles 30 to 40 ft. in length not needed on present. Will sell lot cheap.

BISHOP & BUCHANNAN,
24-27 Owen Sound, Ont.

For Sale

One No. 1 Marsh-Capron Rail-Track Concrete Mixer, with Trucks, Steam Engine and Boiler, elevating Side-Loader and automatic Measuring Tank. Capacity, 9 cu. ft. of mixed concrete.

This is a first-class machine and has never been used. Will be sold at a bargain as the owner does not now require it.

Apply to Box 801, Contract Record, Toronto, Ont. 23-26

For Sale

Large deposit of a fine grained massive trap rock. Trap is of the very best quality for road work. Can be very cheaply quarried. Railroad runs right through the property. Freight rates reasonable. Apply S. A. Wookey, c/o British American Hotel, Kingston, Ont. 24-26

For Sale

300 tons new No. 30 aril and plates.
2 Portor Locomotives, 15-ton, standard gauge.
50 4-yd. one-way Dump Cars, standard gauge.
1 pile Driver, 35 ft. Leads, 2600 lb. Hammer.
Apply, J. J. GARTSHORE,
26-27 58 Front St. W., Toronto, Ont.

For Sale

1 Scow, 15 x 30 ft., nearly new.
1 Anchor, 400 lbs.
1 Anchor, 300 lbs.
3 Anchors, 200 lbs. each.
2 Sling Chains, 25 ft. long.
1 set Deferential Blocks complete.
1 pair of Shear legs.
1—12-in. Lead Pot (for melting).
1 Diaphram Pump (for drains).
1—5-in. Centrifugal Pump.
1 Tool Truck.
25 Drain Stays, 2 ft. 6 in.

Apply to McQuillan & Company,
1457 Queen Street West,
23-25 Toronto, Ont.

BARGAINS!

1 Thew Steam Shovel, used less than 90 days, shop number 690; like new	$3,300
30 1½-yd. dump cars, 36-in. gauge; practically new. Each	30
1 American Well Air Compressor, 10 x 14; A.1.	240
1 Buckeye Trenching Machine, steam driven; cuts trench 27-in .wide to 8 ft. deep. Overhauled and A.1.	2,500
2 American, 6¼ x 10, D.C., D.D. Hoisting Engines with boilers and boom swingers, A.1. Each	725
1 Three-drum Stronsburg 7 x 10 Hoisting Engine with boiler; practically new.	725
1 Gates No. 5 Crusher, 2 arm Spider, rear drive (Rebuilt B.) Exceptionally low price.	

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

Situations Vacant

WANTED—Capable young man to estimate on Plumbing, Heating and Ventilating work. One with experience preferred. Apply in own handwriting stating salary expected. Box 818, Contract Record, Toronto, Ont. 26

WANTED—Architectural draughtsman, improver of few years experience, steady position, with experience to be gained in all branches of the work. Apply by letter, stating salary expected, etc. Philip C. Palin, architect, Collingwood, Ont. 25-26

DO YOU NEED HELP?

For construction work; Sewer, Bridge Work. We furnish skilled and unskilled labor for all kinds of work.

O'Donnell's Employment Bureau,
116 Wellington Street West,
Toronto, Ont.
Phone Ade. 3919. F

Residences

(Continued from page 69)

Chambers. General contractor, W. F. Slack, 95 Flora. Solid brick construction, stone foundation.

Residence, cost $7,000, Echo Drive, for Miss M. Munsie, 43 Aylmer ave. General contractor, J. R. Howe, 324 Mutchmor. Stone construction and fndn.

Residence, cost $7,000, Clemow, for J. G. Davidson, 273 1st ave. Architect and general contractor, N. Hollister, 512 Bay street. Brick construction, stone foundation.

Quebec, Que.

Residence, cost $9,000. Builder and general contractor, Jos. Proteau, 4th St. Limoilou. Three storeys, 108 x 30, stone foundation, reinforced concrete and brick construction. Excavating started.

Residence, cost $7,000, for E. Rochette, Turnbull St. Builder and general contractor, Pierre Tardif, Turnbull St. Four storeys, 26 x 58, stone foundation, brick construction.

Residence, cost $5,000. Builder and general contractor, M. F. D. Pare, 5th St. Limoilou. Three storeys, 30 x 40, stone foundation, brick construction. Excavating started.

Residence, cost $10,000, for Elie Cantin, Lee & Cartier Sts. Architect, R. P. Lemay, 19 d'Aiguillon. General contractors, Cantin & Boirier, Lee St. Stone foundation, reinforced concrete and brick construction. Three storeys, 65 x 32.

Toronto, Ont.

Residence, cost $25,000, Lonsdale and Warren, for H. Winnett, 198 Beverley street. Architect, F. S. Baker, Traders Bank. Masonry, Gordon Bros., 249 McCaul street. Carpentry, R. Sherwin, 624 Parliament street. 40 x 60, stone construction. Foundations in.

Residence, cost $18,000, Russell Hill road and Heath, for H. C. Tomlin, 418 Bathurst street. Architects, Sproatt & Rolph, 36 North street. Mason, Wm. Hughes, 216 Simcoe street. Carpenter, A. Weller & Co., 54 Tecumseh street. 2½-storeys, 44 x 61, structural steel and brick construction. Foundations in.

Apartments, Walmer and Heath, for T. H. Cooper, 255 Russell Hill Drive. Architect and superintendent, C. Earl, 81 Duggan Ave. Work, day labor. Foundations in.

Residence, cost $5,500, Rosehill, for T. G. Crown, Ferndale. Builder, E. Martin, 4 Fairview. 2½ storeys, 34 x 42, brick construction, brick foundation.

Three pairs residences, cost $18,000, Duggan. Owner and builder, J. Gibson, 1473 Yonge street. Two storeys, 36 x 42, brick construction and foundation.

Residence, cost $7,000, High Park Gardens, for H. D. Glendenning, 13 High Park Gardens. Architect, J. W. Siddall, James Bldg. General contractor, J. C. Claxton, 250 Shaw street. [illegible] 28 x 44, structural steel and brick construction, brick foundation.

Winnipeg, Man.

Residence, cost $[illegible], Oxford street. Architect and builder, W. H. McMillan.

307 Dixon Court. 2½-storeys, stucco construction. Permit issued.

Residence, cost $6,000. Architect and builder, E. W. Lowery, Ste. 4. Oliver Court. Two storeys, stone foundation, pressed brick construction.

Power Plants, Electricity and Telephones

Edmonton, Alta.

Extension to telephone system. Contracts were awarded to The Edmonton Construction Co., 623 2nd St., at $33,500, and Hulbert & Wilson Co., Gen. Del., at $18,666. Clerk, C. E. Cox. Engineer, A. J. Latornel.

King, Ont.

Council contemplates having hydro-electric lighting for township. Clerk, James L. Jenkins, King, Ont.

Merritt, B.C.

Town Council plan addition to power plant. Will install a second 125 kw. unit, 3-phase, 60 cycles, 2300 volts, within the next year.

Miscellaneous

Montreal, Que.

Boilers required by the Board of Commissioners. Secretary, L. N. Senecal. Engineer, T. W. Lesage. General contractors, Canada Foundry Co., 162 St. Antoine.

Port Arthur, Ont.

The Western Dry Dock & Shipbuilding Company have the following work in hand—1 large tug for Jas. Whalen, Port Arthur; 1 stern wheel passenger boat and 1 barge tug for C. P. R. Kootenay Lake Service; 1,625 ft. freight boat for Montreal Co., also "Noronic," 385 ft., launched June 2nd.

Vancouver, B.C.

Automobile fire apparatus for City Council, Clerk, Wm. McQueen. Two city service trucks, 1 combination hos wagon and chemical, both motor driven. The tender of W. E. Seagrave was accepted at $8,000.

Business Notes

McNeil's Crossing, Que.

Block factory, owned by Willard & Son. Totally destroyed by fire, loss amounting to several thousand dollars.

North Hatley, Que.

"Bonnie View Hotel," owned by H. A. Wise, Sherbrooke, burned, loss $8,000.

Pointe Aux Trembles, Que.

Bank and store owned by O. Gervais, grocer, loss $25,000; insurance $13,000, and Bank of Hochelaga, head office Montreal, loss over $5,000. Will rebuild.

Rossland, B. C.

Fire damaged War Eagle shaft house, mining timbers, ore bins, tank house, etc., of Consolidated Mining & Smelting Company. Manager M. E. Purcell. [illegible]

St. John, N.B.

Warehouse burned, owned by E. R. Owens, London, Eng., c/o G. O. D. Otty, Richey Bldg., Princess street, St. John. Wholesale liquor warehouse, loss to building, $25,000, covered by insurance.

Welland, Ont.

Court house, burned. Loss, $50,000 to $100,000. Clerk, Robt. Cooper. Arch Warden, J. H. Atwood, Bridgeburg, Ont.

New Companies

Stevenson & Malcolm, Limited, have been incorporated with a capital of $30,000, to carry on business as gas fitters, electricians, contractors and dealers in building material, with head office at Guelph. The provisional directors are Andrew Malcolm, contractor, R. S. Clark, law student and John Sutherland, Jr., insurance agent, all of Guelph.

Silverthorn Land Company, Limited, incorporated with a capital of $40,000, to carry on a general land and building company with head office at Toronto. The provisional directors are Frank McLaughlin, E. V. Oaf, estate agents, and W. L. Reed, insurance agent, all of Toronto.

The Nestor Falls Timber Slide and Improvement Company, Limited, has been incorporated with a capital of $30,000, to carry on business as a timber slide company to construct dams, etc., for handling logs, etc., with head office at Kenora. The provisional, directors are J. W. Short, lumberman, C. J. Short, accountant, and H. A. C. Machin, barrister, all of Kenora.

MacLean Daily Reports Limited

The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West - TORONTO

For Rent—Cottages

If you want a real holiday, plan to spend your vacation this year in Muskoka where the [illegible] [illegible] will put new life [illegible] Muskoka offers more [illegible] resort in the world.

Four cottages to rent [illegible] on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box [illegible]

Contract Record, Toronto Ont.

No Matter What Conditions are Our Conveyor Belting Will Give You 100 per cent of Service

A broad statement—but justified by the unique reputation which our beltings have won, and maintained, through years of competition.

To-day, throughout Canada—under the most exacting conditions—our Conveyor Beltings are carrying thousands of tons of Ore, Coal, Cement, Gravel, Grain, etc.—in the biggest and most progressive plants.

Plants where Beltings are purchased only after the closest analysis of their actual working records.

Such tests have proved that Our Conveyor Beltings possess to a remarkable degree—

Toughness of Surface - Tensile Strength - Flexibility

It is of vital importance to you—whether your belting purchases be great or little—that the belting you buy will stand up under the conditions as they exist in your plant.

Ours will—we know it will Because the experience of years, and the skill of experts familiar with actual working conditions—is back of its construction.

And our plant—the oldest and largest in Canada—is specially equipped to meet your requirements.

Let us help you with your belting troubles.
We are willing—and know how.

Canadian Consolidated Rubber Co., Limited

SALES BRANCHES:
Halifax, ST. JOHN, Quebec, MONTREAL, Ottawa, TORONTO, Hamilton, London, Berlin, Brantford, North Bay,
WINNIPEG, Regina, Saskatoon, Edmonton, Calgary, VANCOUVER, Victoria

Have Pedlar Make Construction Fire Retardant

THE PEDLAR PEOPLE make a very large number of metal specialties for buildings of all kinds. These are either unburnable in themselves, or are used in combination with Portland Cement. They cost comparatively little. But they can transform inflammable wooden construction into a structure which is of the "slow-burning" type.

No matter where buildings are located, or what they are constructed in—whether wood, brick or concrete—the Pedlar People can give additional fire protection. Do you want it at moderate expense? Usually a commercial building has a dozen danger points for fire. In an otherwise fire-resistant structure, these danger points are neglected "Pedlarize" them.

We will be glad to have you write us at our nearest branch. We will go over your projects with you, and provide safe ceilings, columns, roofs, doors and firewalls, elevator shafting—the dozens of unsafe places.

We will talk to you about these things and show efficiency. The work of installing may be done easily with ordinary local labor.

Why not write us an opening letter? Indicate the specification you are working upon.

What Does a Structure Need?

If the roof is not safe, within or without, we can supply Pedlar "George" Shingle for wood sheathing, and Pedlar Lath to go beneath the rafters with cement plaster. We can also supply Metal Vents with Fire Links, Metal Skylights, etc. These are made to suit the particular roof specifications.

PEDLAR

Or we can supply Pedlar Ferro-Dovetail Plates to make a concrete roof above and below on any portion of your projected construction.

If a structure needs fire walls around shafting for elevators, fire-retardant ceilings etc., you may be supplied with Pedlar Metal E-Studs and Metal Furring Strips, to be used with Pedlar Metal Lath and cement plaster. Or you may have metal sheathing applied. At low cost wooden columns may be made fire-retardant, and floors fire-proofed by proper ceiling protection. For this furring and lath in metal is used.

Exterior walls may be sheathed in Pedlar Galvanized Siding or Corrugated Iron. Exits and woodwork or doors may be metal sheathed. Engine rooms, oil storage rooms, etc., may be made safe against fire.

Correspond for specifications of any kind on new buildings or structures you are remodeling.

The Pedlar People Limited

Est'd 1861

MONTREAL
321-3 Craig Street W.

TORONTO
113 Bay Street

WINNIPEG
76 Lombard Street

LONDON
86 King Street

OTTAWA
423 Sussex Street

HALIFAX, N.S., 16 Prince St.
ST. JOHN, N.B., 42-46 Prince William St.
SYDNEY, N.S., 194-208 George St.
QUEBEC, QUE., 127 Rue du Pont
CHATHAM, ONT., 200 King St. West.

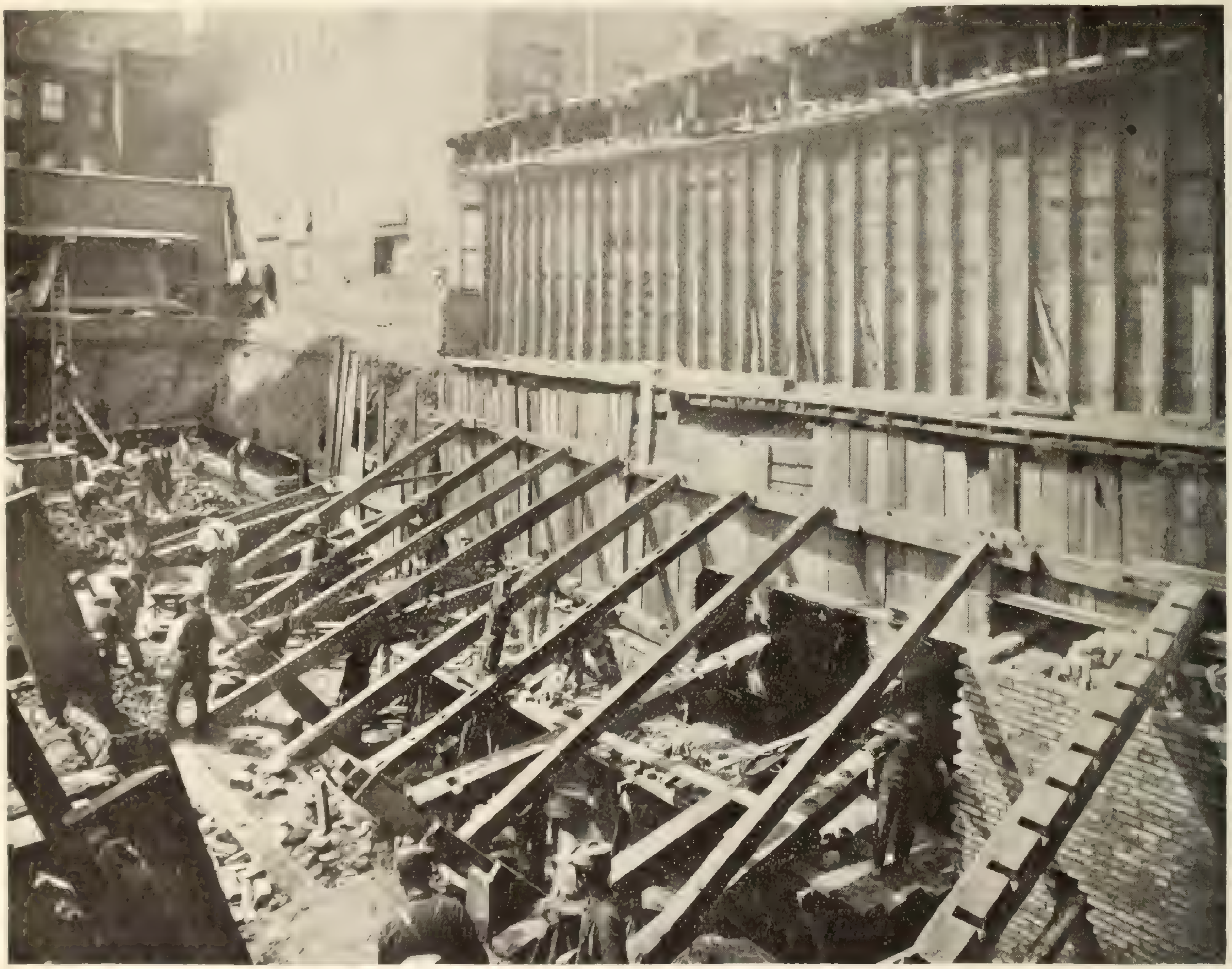
PORT ARTHUR, ONT., 45 Cumberland St.
CALGARY, ALTA., Rm. 7, Crown Block
MEDICINE HAT, ALTA., Toronto St.
MOOSE JAW, SASK., 202 Fairford St.
LETHBRIDGE, ALTA., [illegible] First Ave. S.

SASKATOON, SASK., Box 1645.
EDMONTON, ALTA., [illegible] St. West.
VANCOUVER, B.C., [illegible] Alexander St.
VICTORIA, B.C., [illegible] Kingston St.

Head Office and Works: OSHAWA, CANADA

Let Us Tender on Your Roofing and Waterproofing Specifications

We supply roofing, waterproofing and insulating materials of all kinds and undertake contracts for roofing and waterproofing, our complete equipment enables us to execute the work in accordance with Architects' and Engineers' specifications.



Foundations of Marcus Loew's New Theatre, Toronto.

General Contractors, Fleishmann Bros., Toronto. T. H. Lamb, Architect, New York City.
Makepeace & Makepeace, Associate Architects, Toronto.

Our work on many notable Canadian buildings is a guarantee of our ability to successfully carry out the most important contracts.

The Waterproofing of the above foundation executed by:

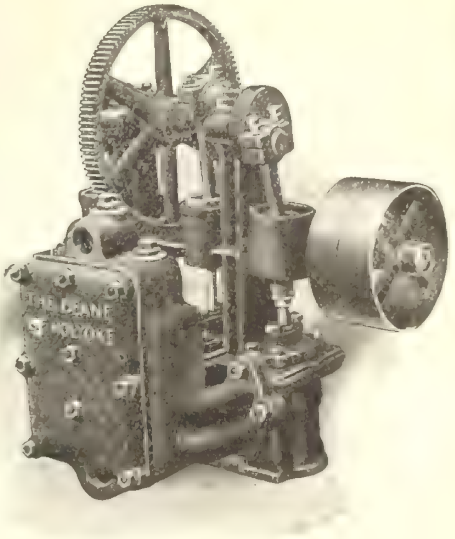
Canadian Supply & Contracting Company, Ltd.

Structural Waterproofing Engineers and Contractors

Roofing, Waterproofing and Insulating Materials

220 King St. W., Toronto

DEANE POWER PUMPS



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HOUSE SUPPLY

BOILER FEEDING

TANK SERVICE

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.

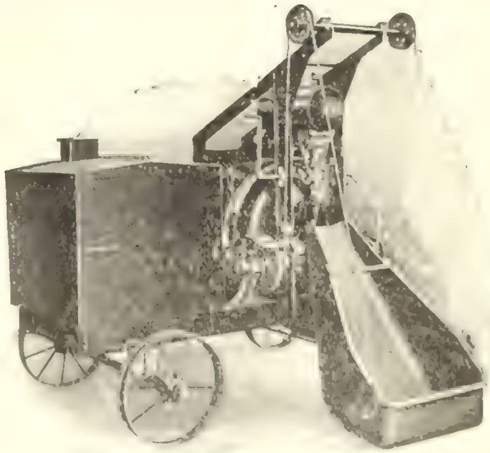
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

On All Classes of Work KOEHRING MIXERS are mixing their way to popularity because of the Dollar Saving Qualities

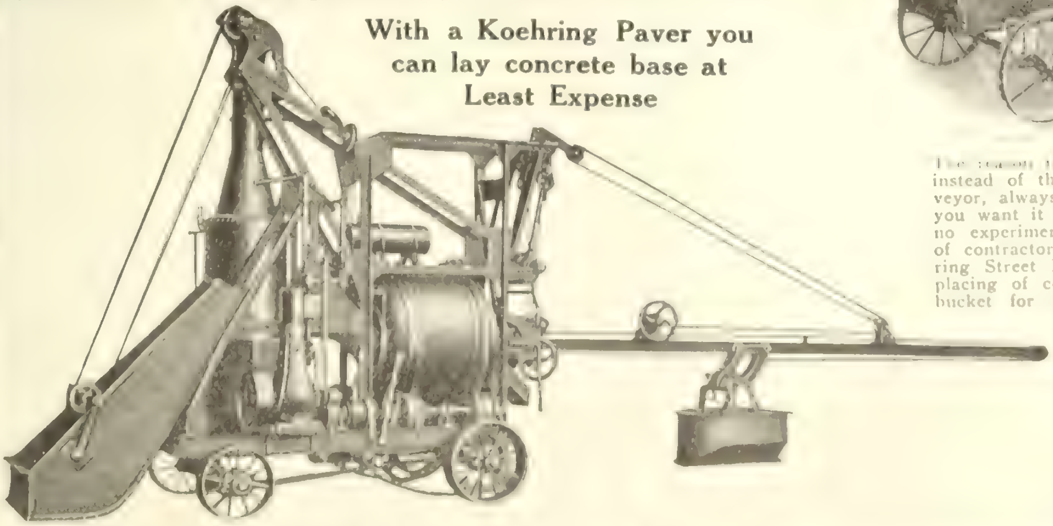
The Koehring 3 in 1 principle of mixing means three times as much mixing or an equal amount of mixing in one-third of the time. There are three independent and opposed mixing actions in the Koehring drum producing thoroughness of mixing and rapidity of mixing and a uniformity of mixing, no other Mixer equals. There are also equally important advantages in the mechanical construction of the Koehring Mixer.

The heavy cast special metal Koehring drum will outlast the drum of any other Mixer. The railroad truck bearing truss and the rollers being keyed on to the axle, makes "wabbly" drums impossible.

The charging bucket raises to a nearly vertical position so that all the material will pass into the drum without pounding the bucket. There are numerous other important features in the Koehring Mixer that you should know about.



With a Koehring Paver you can lay concrete base at Least Expense



The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds contractors' reputations and pays handsome profits. Aren't you interested in this reputation and [illegible]

KOEHRING MACHINE CO., Milwaukee, Wis. Exclusive Sales Agent for Canada Canada Foundry Co., Limited

Toronto Montreal Halifax Ottawa Cobalt Winnipeg Calgary Vancouver Nelson

HOISTING ENGINE REPAIRS

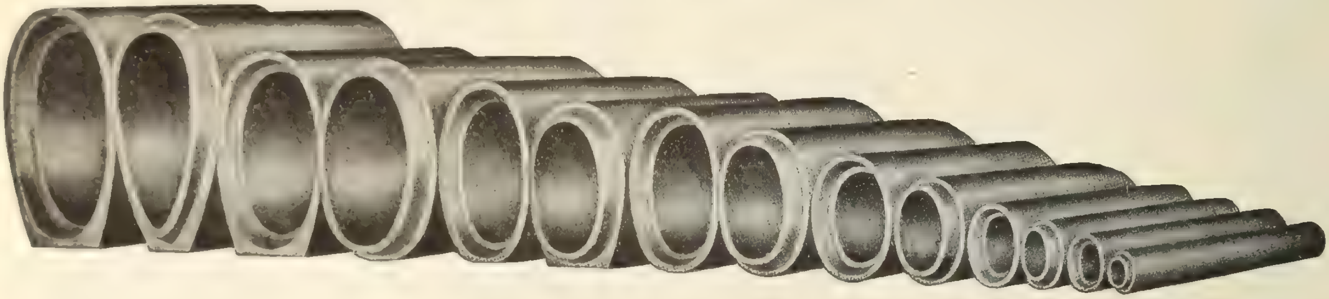
We carry a full line of repair parts for our hoisting machinery at all times. Prompt shipment made on anything you require.

Send for Descriptive Sheet showing Parts and number to order by.

Hoists of all kinds, Winches and Derrick Irons supplied on shortest notice.

SALES AGENTS
MUSSENS
LIMITED
Montreal, Que.

MARSH & HENTHORN LTD.
Makers of Hoisting Machinery, BELLEVILLE, ONT.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. **Stock sizes 6 in. to 60 in.**

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.
Kemptville, Ontario

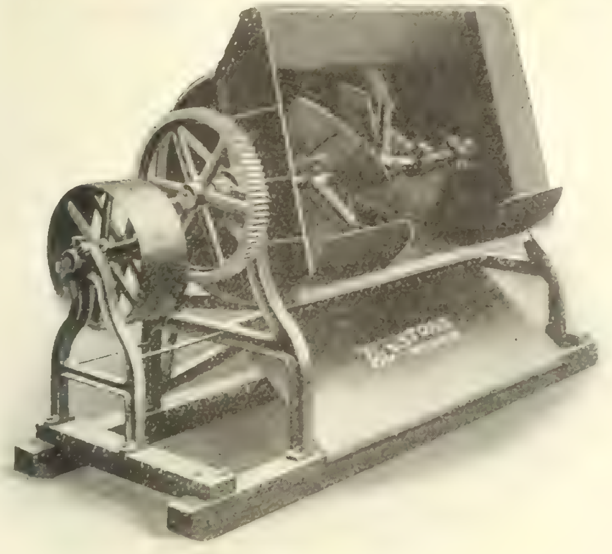
EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited
Galt, Ontario, Can.
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

The Best Service at Lowest Cost



The Blystone Skid Mixer

The perfect design and construction of this mixer reduces the working cost to a minimum and effects the greatest ease in operation. All working parts are strongly made and will not get out of order.

Easy to work—Easy to Clean High efficiency—Low cost

SEND FOR PARTICULARS

The Blystone Machinery Company

61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by

The A. R. WILLIAMS MACHINERY COMPANY, Limited
Contractors Department No. 1, TORONTO, CAN.

Sole Distributors for Canada

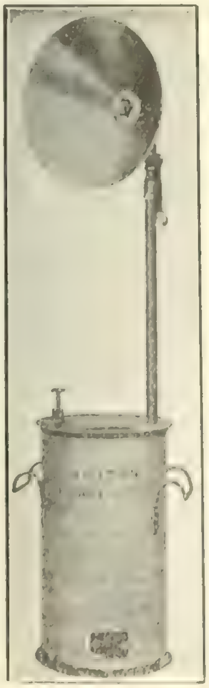
"Metallic"

Steel Siding

No matter whether a new building is to be erected or an old one remodelled, you will be in a position to get some very profitable business if you are handling "Metallic" Steel Siding. This Siding, made in many styles, either painted or galvanized, is fireproof, damp and cold proof and most attractive in appearance. Its low cost and high quality commend it to a large class of builders. Don't delay writing for complete, illustrated catalogue R 2 and prices, so that you can start this profitable trade your way.

THE METALLIC ROOFING CO.
OF CANADA LIMITED.
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights



Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by

International Marine Signal Co. Limited
Ottawa, Canada

FOR SALE

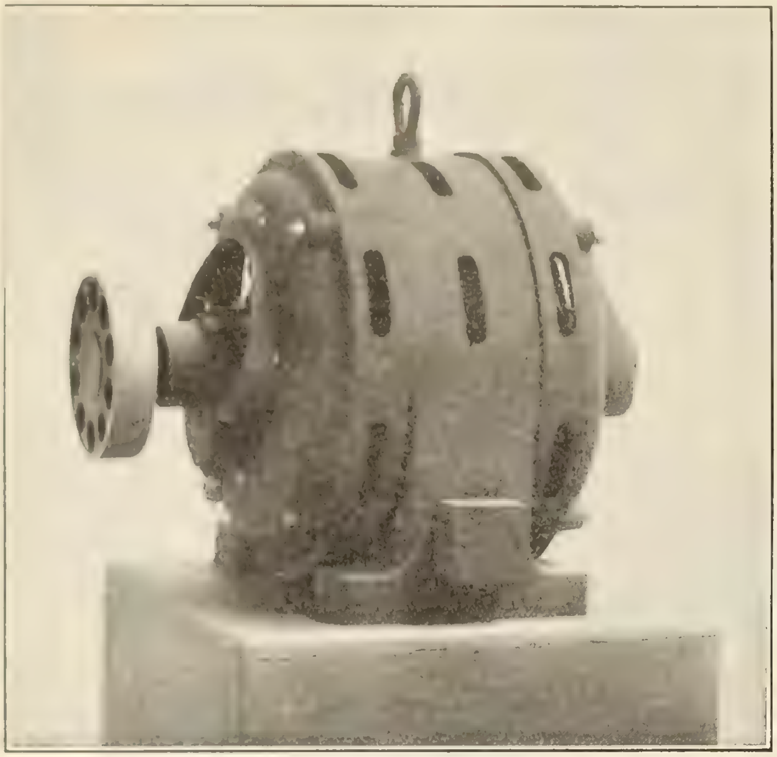
1—10 x 16 Standard Gauge Porter Locomotive
1—12 x 15 Waterous Slide Valve Engine
1—6 1-2 x 8 American D.C. D.D. Hoist with Swinger
1—7 x 10 Lambert D.D. Hoist
1—10 x 12 Beatty D.C. D.D. Hoist with Swinger
1—5—Ton Tandem Roller
1—20 H.P. Waterous Portable Boiler
1 30 H.P. Locomotive Boiler on Skids
5 Rock Drills
1—No. 2 Smith Concrete Mixer
1 No. 2 Milwaukee Concrete Mixer
1—15 H.P. Upright Boiler

The above machines are but slightly used and are in good working order.

Fleming Machinery Company

340 Sparks Street, Ottawa, Ont.

Engineering Works of Canada, Limited



SQUIRREL CAGE MOTOR

Head Offices: New Birks Building,
MONTREAL, QUE.

All kinds of
Mechanical and Electrical Machinery

Builders under the patents of
Societe Alsacienne

ESTABLISHED 1826

Automatic Elevators
Passenger and Freight

Simplicity **Foolproof** **High Efficiency**
Patent Single Phase Motor **High Starting Torque**

Aluminum & Crown Stopper Bldg., Toronto, Ont.
5266 pounds of CERESIT used on this building.

WARNING

From a Leading Civil Engineer:

"The number of mistakes made through inadequate provision for Waterproofing, and their costly consequences, running into thousands of dollars, should serve as object-lessons to those who have the design of concrete work in hand and the same degree of attention and study should be given the subject of water tightness as that given to other details of construction."

In the consideration of this subject we direct your attention to CERESIT Waterproofing.

This product when mixed with concrete or cement plaster coating, makes the same uniformly and permanently damp and waterproof.

"Ceresit" Waterproofing

Ceresit is used for waterproofing basements, boiler pits, conduits, culverts, foundations, tunnels, reservoirs, swimming tanks-walls, roofs, floors and every sort of construction in which cement enters,

It is Catalogued in "Sweets" Index.

AGENTS WANTED IN UNOCCUPIED TERRITORY

CERESIT WATERPROOFING CO.

Commercial Bank Bldg., CHICAGO.

CANADIAN BRANCHES
Douglas Milligan, Ltd.. 304 University Street, Montreal.
W. K. McDonald Co. Crown Office Bldg., Toronto.
Grose & Walker Ltd., 259 Stanley St., Winnipeg.
E. G. Cullen, 418 Pacific Bldg., Vancouver, B. C.
Carritte-Paterson Co.,Ltd., St. John, N.B.
Carritte-Paterson, Ltd., Halifax, N. S.

Ceresit Factories are located in Chicago, Unna, Westphalia, Germany, London, Paris, Vienna, Warsaw, Russia

Please cut this out

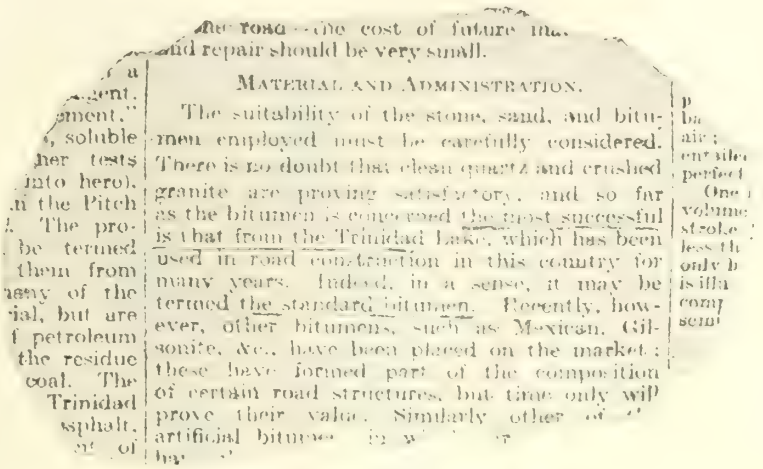
REMINDER

to write for Free Book "S" on how to Effectively and Permanently Waterproof Concrete and Cement Mortar.
CERESIT WATERPROOFING CO., Commercial Bank Building, CHICAGO

Trinidad Liquid Asphalt

Bermudez Road Asphalt

Trinidad Lake Asphalt



the road — the cost of future ma… and repair should be very small.

MATERIAL AND ADMINISTRATION.

The suitability of the stone, sand, and bitumen employed must be carefully considered. There is no doubt that clean quartz and crushed granite are proving satisfactory, and so far as the bitumen is concerned the most successful is that from the Trinidad Lake, which has been used in road construction in this country for many years. Indeed, in a sense, it may be termed the standard bitumen. Recently, however, other bitumens, such as Mexican, Gilsonite, &c., have been placed on the market; these have formed part of the composition of certain road structures, but time only will prove their value. Similarly other … artificial bitumen…

Engineering Supplement, London Times.

The Standard of Comparison

Why is it that Trinidad and Bermudez lake asphalts are always the standard of comparison for other bituminous products?

To claim that a paving or road-building material is as good as Trinidad or Bermudez asphalt seems to be considered the strongest endorsement that can be brought forward.

But the materials for which this claim is made are new and untried, and year after year one "Just-as-good-as-lake-asphalt" follows another into oblivion.

Meanwhile the use of the lake asphalts steadily increases and their position as the standard materials by which all others are judged is more firmly fixed (1) by the continued good service of natural asphalt roads and pavements, some of which, though 30 years old, are in service to-day; and (2) by the duplication of unfortunate experience with artificial or near asphalts.

Engineers and officials with reputations to preserve, and taxpayers whose money is to be spent, may well consider also that even if there was any material for paving and road building equaling the lake asphalts in stability, dependability and long life, **it would take 30 years to prove it.**

The Barber Asphalt Paving Co.

Philadelphia, Penn.

Here's Exactly Why Engineers Recommend

Scherzer ROLLING Lift Bridges

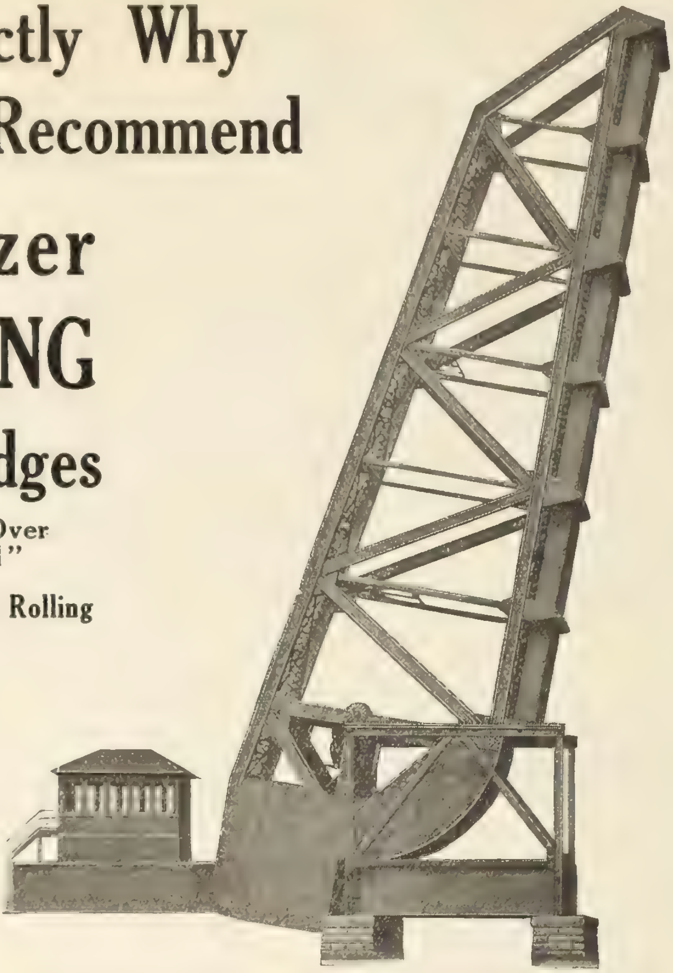
"Used All Over The World"

Designed on the Universal Rolling Principle

200 Scherzer Rolling Lift Bridges now in successful use in the

United States	Egypt
Canada	Russia
England	India
Ireland	Burma
Wales	Hawaiian Islands
France	Mexico
Holland	South America
Belgium	

and other countries.



Notice the simple, rigid, riveted one-piece movable bridge. Extraordinary simplicity and rigidity—greatest efficiency at less cost

Some Reasons Why The Scherzer Rolling Lift Bridges Are Recommended by Engineers the World Over—

It is a riveted complete rigid structure.

Truss has no pin connections.

Very little machinery in structure—about 5 per cent. of total metal. (Machinery costs about three times as much per lb. as structural steel.)

Over 50 per cent. less MACHINERY than a design with trunnions.

So perfectly balanced as to require little power to operate.

Cost of maintenance low.

Raised and lowered without shock.

Less metal than other designs.

Gives maximum clearance of waterway without fender piles.

Machinery or truss not exposed to damage by boat lurching to side.

Concentrated loading at any point not as great as on a trunnion.

Counterweight is fixed. Height of counterweight not much over ordinary truss.

No high towers.

All parts easy of access.

No costly trunnions or heavy castings liable to be displaced.

No uplift to overcome before bridge commences to rise.

Requires shorter piers than a trunnion.

Trusses roll in direct line of standard distance c. to c. of ordinary trusses.

Grade of railway or bridge could be raised in a simple manner.

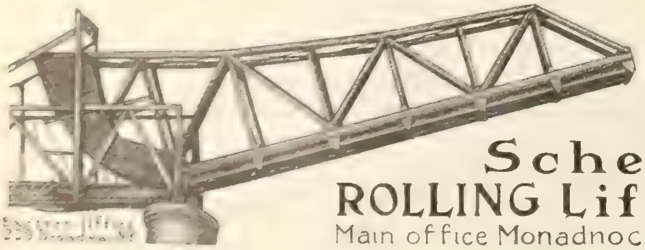
Scherzer ROLLING Lift Bridges cost less to install, operate and maintain—because they are simple, rigid, riveted structures with less metal than any other movable bridge and far less machinery. They are balanced in all positions, minimizing motor power. Their base is rounded just enough to let them roll forward and down, closing them; or roll back and up, opening them. This forward and back motion saves large amounts in material, weight and motive power, as a much shorter span can be used. When open, the bridge is back, away from the channel, preventing accidents from moving boats.

No friction-causing axles, journals or trunnions are used to carry the bridge. There is nothing to lubricate but the small motor and very simple machinery. The curved base rolls on level tracks, using the simple principle of track and wheel used by all railroads. The foundations naturally cost less because the bridge weighs less. No wharfage is needed on either side. New bridges can be added beside the old ones, avoiding wasteful replacement.

A Scherzer ROLLING Lift Bridge can be opened or closed in thirty seconds, a vast saving in time for land and water traffic. Tracks are fastened permanently to the bridge, doing away with rail lifts or end lifts and preventing accidents. When open, these bridges are barriers against accidents and signal distant traffic to stop.

The Foundations Cost Less Because the Superstructure Is So Simple and Weighs Less

Send for sketches, estimates and full information, showing how Scherzer ROLLING Lift Bridges are adapted for the widest channels, with particulars of demonstrated efficiency and economy.

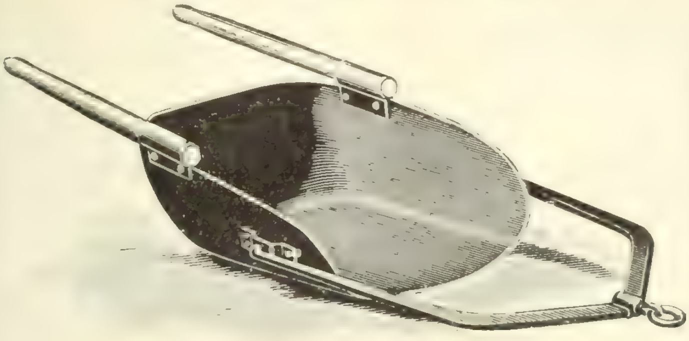


Scherzer
ROLLING Lift Bridge Co.
Main office Monadnock Block Chicago, U.S.A.

Eastern Office
[illegible] Broadway N.Y.

Cable Address
Scherzer Chicago

The Best Value for Your Money



IN CONTRACTORS' SUPPLIES

Our DRAG SCRAPERS have pressed bowls of high carbon steel—all joints and seams being eliminated. They are stiff and serviceable. WHEEL SCRAPERS can be supplied with either square pan or pressed bowl, and have the latest and most approved dumping attachments.

Always order by the name—

IRON AGE

Our STEEL TRAY BARROWS with trays pressed from solid sheets of high carbon steel, without seams or joints, are the standard with all the leading contractors.

Remember we make Pick and Rooter Ploughs to satisfy the most exacting conditions.

Catalogue will be sent free on request.

THE BATEMAN-WILKINSON CO., LIMITED
340 CAMPBELL AVE., TORONTO

We Can Offer You the Results of Long Service Tests

as a guarantee of the durability and economy of our armored cable. The illustration shows the installing of 185,000 feet of

"STANDARD" Steel Tape Armored Cable

in the city of Mexico in 1901. This cable was examined recently by disinterested engineers and found in perfect condition after giving satisfactory service for 12 years.

"STANDARD" Steel Tape Armored Cable is installed directly in the ground in a shallow trench without conduits of any kind. We have hundreds of thousands of feet of our cable installed in this manner and giving economical service. *Write for our literature and prices before you buy.*

Standard Underground Cable Co., of Canada, Limited

Montreal, Que. **Hamilton, Ont.** Winnipeg, Man.
Boston, Mass. Seattle, Wash.

The

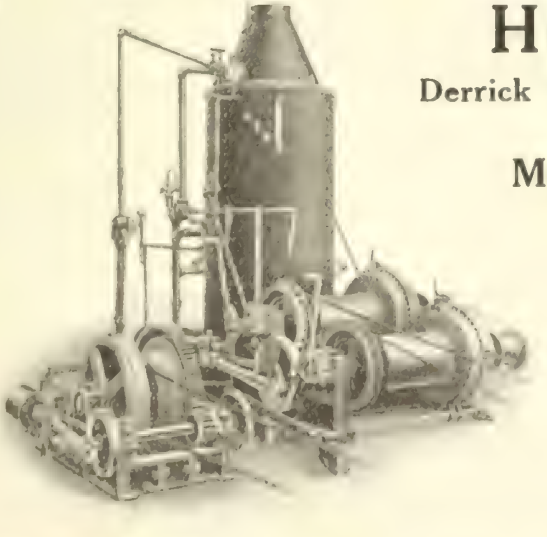
Doty Marine Engine and Boiler Co., Ltd.

Manufacturers of SUPERIOR

HOISTING ENGINES

Derrick Swingers, Material Elevators, Safety Mine Cages, Etc.

MARINE ENGINES BOILERS



The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.

Doty Engine Works Co. of Winnipeg, Ltd.
Foot of Water Street, WINNIPEG, Man.

Built With

Hamilton Pressed Brick

Mallory & Thatcher, Architects.

These fine new apartments in Toronto are being built of the popular Hamilton Red Pressed Brick

Popular, because its deep uniform red shade is always the same and never fades.

1,000,000 bricks are on hand in our yards ready for immediate shipment.

Hamilton Pressed Brick is made from shale, rich in ironoxide and free from so called soda.

It has been used in many of the leading public buildings, schools and residences throughout Canada.

Send us your next rush order.

Hamilton Pressed Brick Company
Limited

Spectator Building, Hamilton, Ont.

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Factory 1992
Office 2931
Residence 345

Toronto Representative, WALTER HUNTER, 105 MACDONELL AVE. Telephone Park 3170

ELECTRICAL
Wires and Cables
In
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Copper Clad (Duplex Metal) Wire

Galvanized Steel Strand for Guys

Canada Wire & Cable Co., Limited
1170 Dundas St., Toronto

Stock of Wire and Cable carried in
TORONTO, MONTREAL & WINNIPEG

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Lime	Fire Brick
Portland Cement	Sewer Pipe
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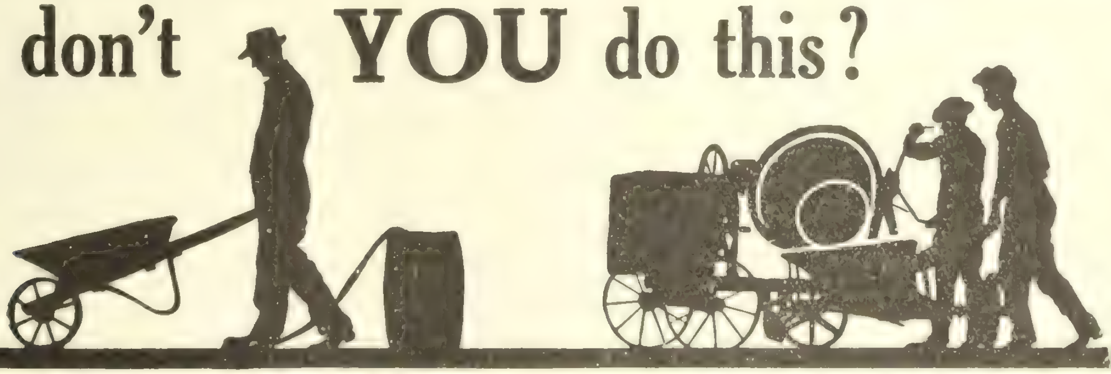
Keenes Cement	Sacketts Plaster Board
Plaster Paris	Parkers Corner Bead
Hard Wall Plaster	Rubble Stone
Mortar Colors	Crushed Stone, Etc.

With our 9 Branch yards situated as they are we are prepared to guarantee a prompt delivery service of any orders you may favor us with and would ask you to give us a trial in order that we might prove same to you and also prove the excellence of our material.

Ontario Lime Company
Limited
Crown Office Building, Toronto, Ont.
Head Office Phones: Main 5472—5473

Why don't YOU do this?



PAID FOR ITSELF IN ONE MONTH

Peterson, Iowa, Jan. 29, 1912

I first saw one of your LITTLE WONDERS working at Everly, Iowa, and it looked so good to me that I bought a machine at once.

My LITTLE WONDER "FIVE" paid for itself in just one month. I have worked around several different mixers, and the LITTLE WONDER "FIVE" has them all beaten.

W. J. JOHNSON, Contractor and Builder.

LITTLE WONDER "FIVE"

"The Small Job Money-Maker"

You can make more money with this Concrete Mixer than with many of larger capacity and greater cost. Mixes 35 to 50 cu. yds. per day on one gallon of gasoline—many contractors far exceed this. Saves 50 cents per cu. yd. over hand work.

TEN DAYS' FREE TRIAL

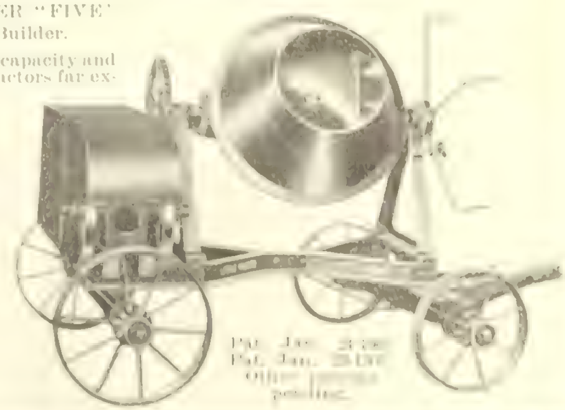
and our "Man to Man" proposition for payments make this the best "buy" ever known in mixers for small work. Thousands of contractors in the States are doubling their profits with it—why not you?

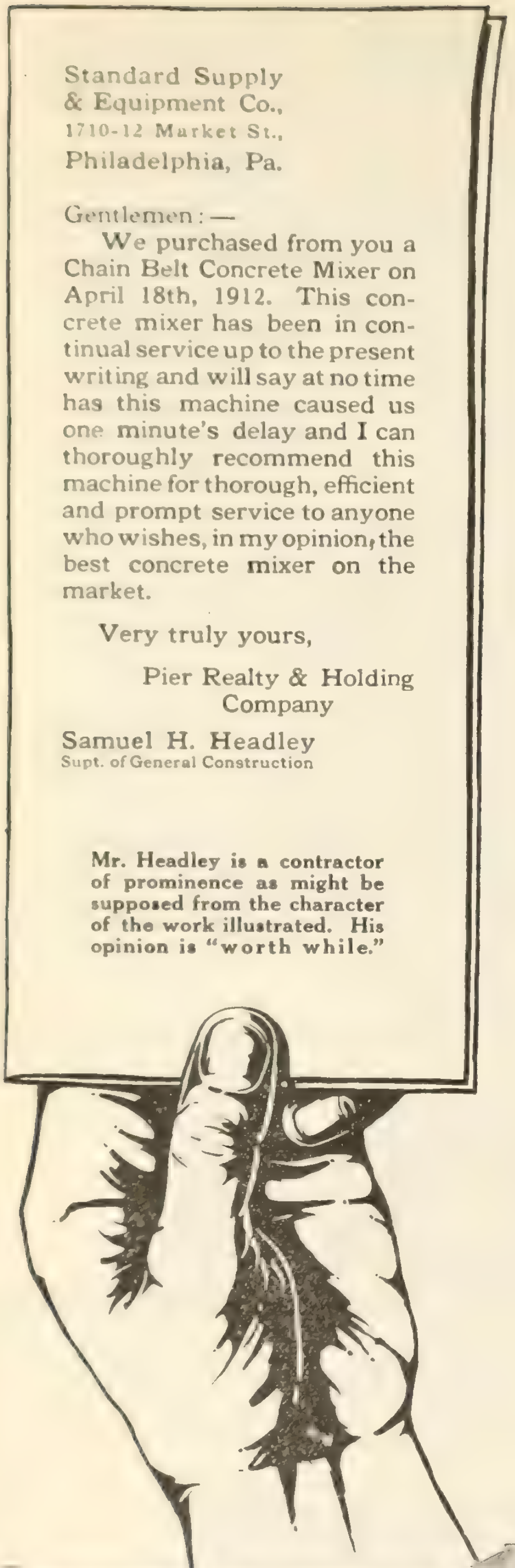
If you want a machine for heavy work look into our WONDER "TEN" capacity 10 cu. ft., or 1/3 yd. "Sack to the batch." Same FREE TRIAL, same liberal terms.

Send for our "Man to Man" proposition NOW, while you are thinking about it.

CANADIAN REPRESENTATIVES WANTED

WATERLOO CEMENT MACH'Y CORP'N
117 Vinton St., WATERLOO, IOWA





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The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

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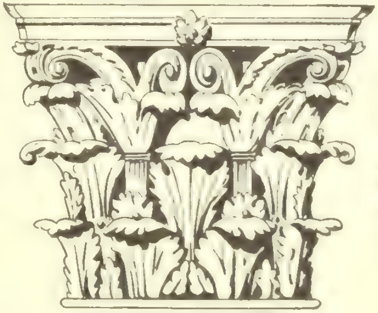

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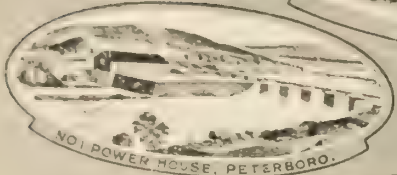

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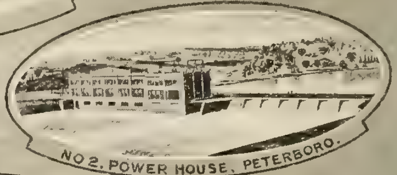

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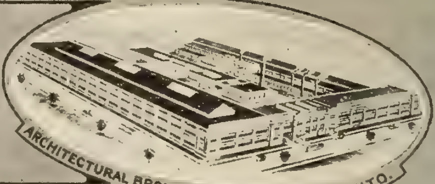

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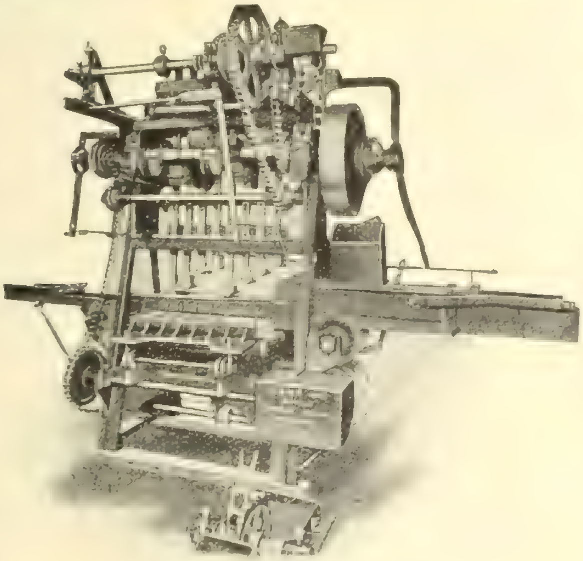

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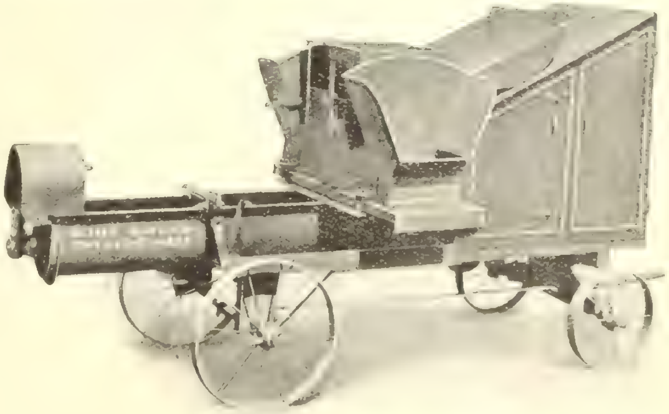

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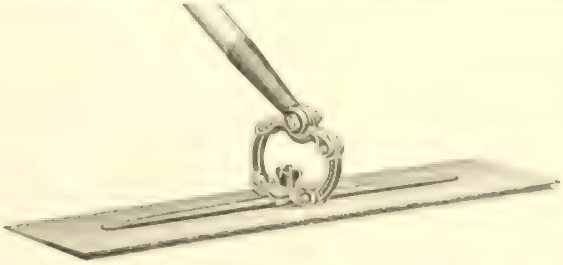

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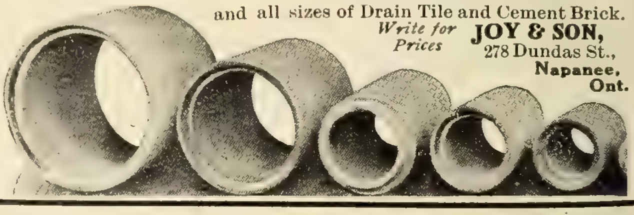

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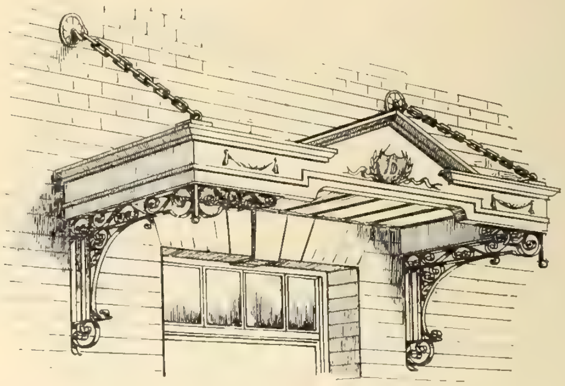

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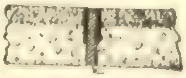

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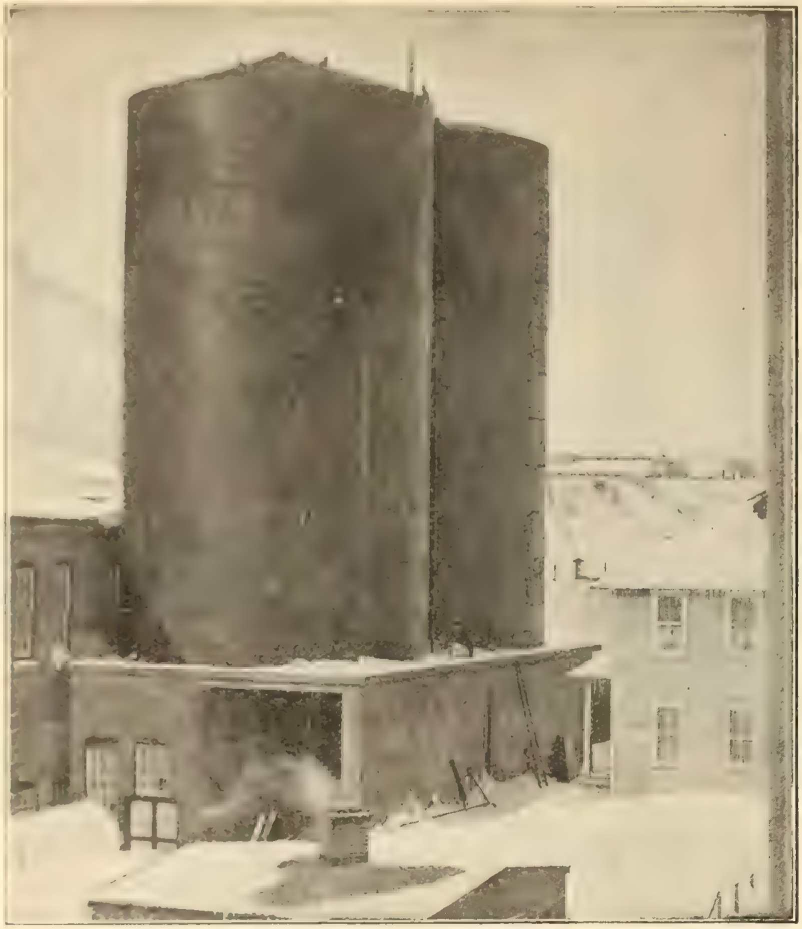

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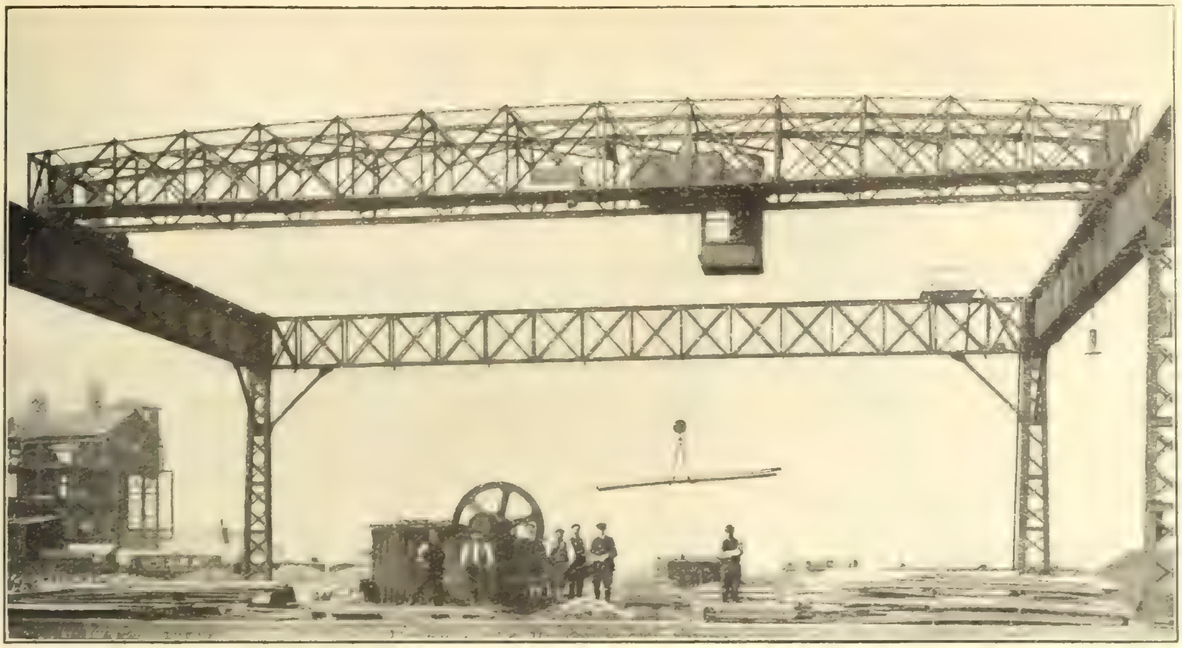

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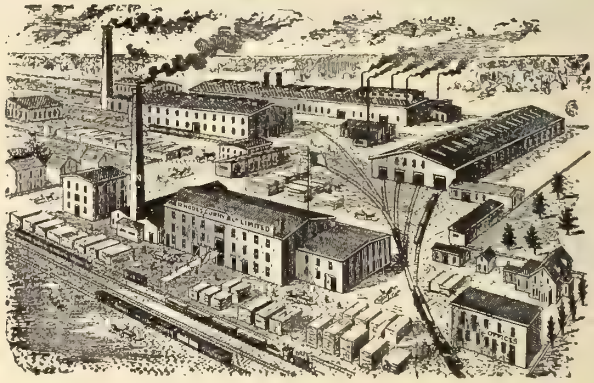

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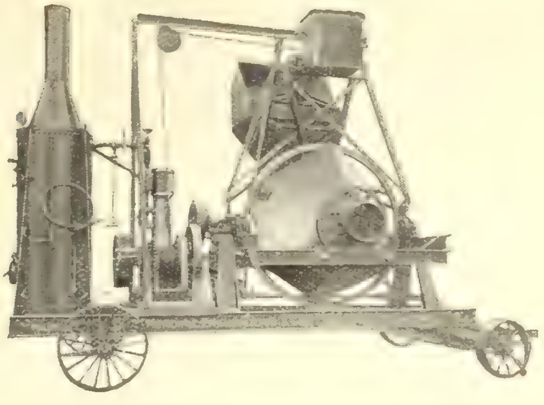

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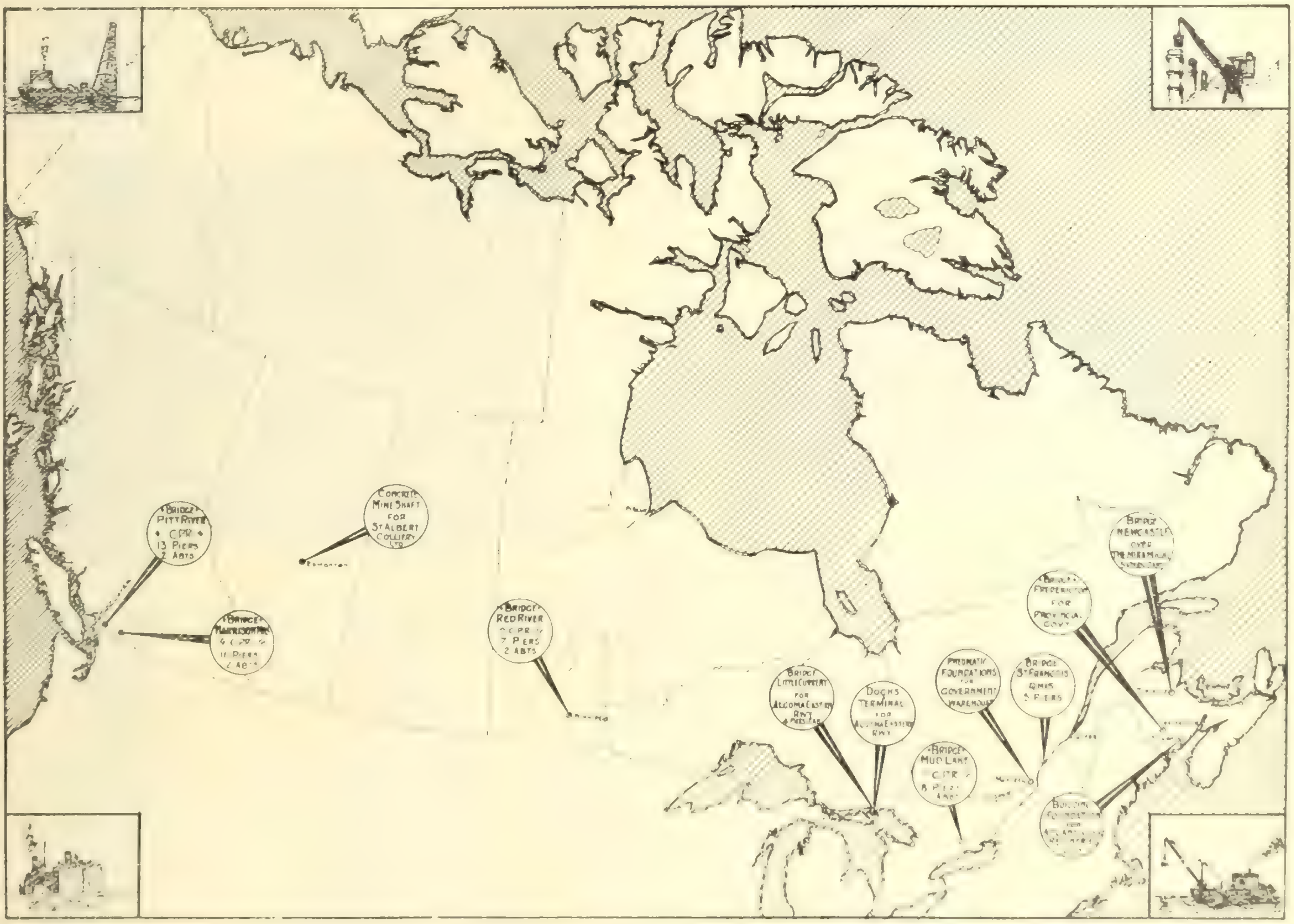

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for Eight Bridges and Two Large Buildings
By Open and Pneumatic Methods

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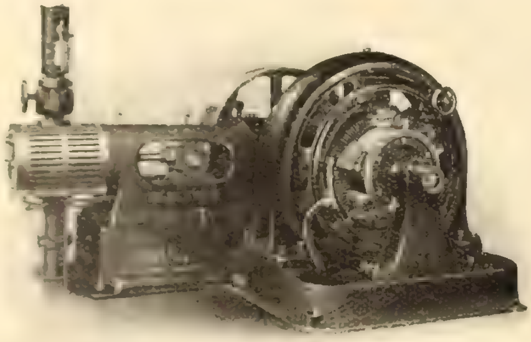

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The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5" water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

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Current Prices of Building Material.

BRICKS

[illegible] delivered at [illegible]

	Per M
[illegible]	$18 00
[illegible]	18 00
Red Stock Bricks	13 00
[illegible]	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

[illegible]

2 in. x 4 in. to 2 in. x 12 in., 8 to [illegible]	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
[illegible]	24 00	28 00
No 2 Hemlock dimension and 1-in.	20 00	22 00

[illegible]

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
7/8 x 8 and 10 in. pine shelving..	36 00	42 00
7/8 x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

[illegible]

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

[illegible]

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
[illegible]		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for [illegible]

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
[illegible]		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26 40	3 75	5 50
41 50	4 25	6 25
51 60	4 75	7 00
61/70		8 00
71 80		9 00
81 85		10 00
86 90		11 00
91 95		13 00
96 100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

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Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

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Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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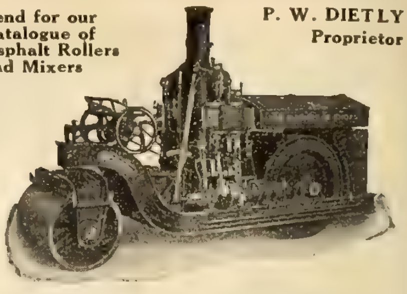

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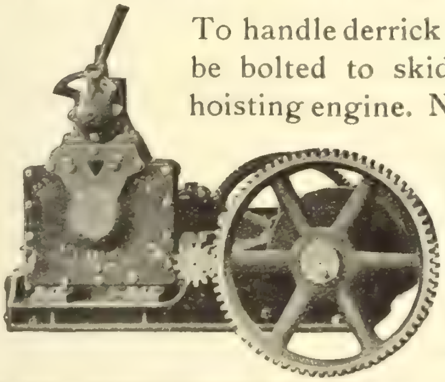

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To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

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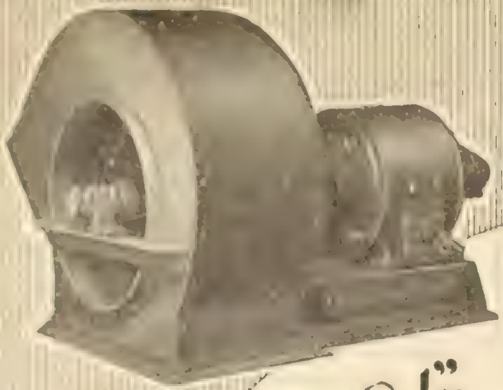
Stock carried by F. H. Hopkins & Company, Montreal



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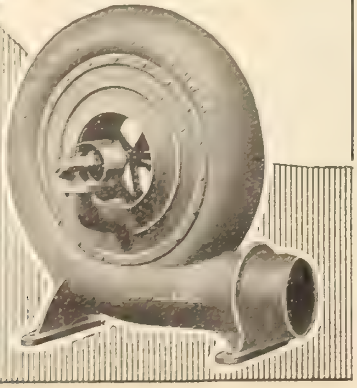

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For Surface Hardening Concrete Floors.

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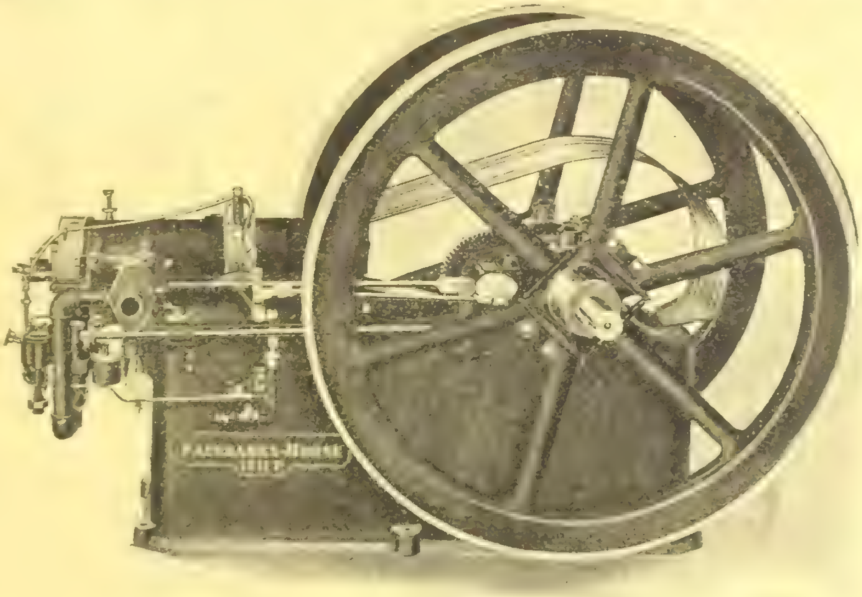

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